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COMMITTEE ON THE PEACEFUL
USES OF OUTER SPACE

REPORT ON THE UNITED NATIONS WORKSHOP ON ENHANCING SOCIAL, ECONOMIC AND ENVIRONMENTAL SECURITY THROUGH SPACE TECHNOLOGY, HOSTED BY THE GOVERNMENT OF AUSTRIA

(Graz, Austria, 12-15 September 1994)

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INTRODUCTION

A. Background and objectives

1. The United Nations Office for Outer Space Affairs (OOSA) has organized several regional and international conferences and workshops on various aspects of space science and technology. Participants in these activities have developed a number of recommendations concerning the establishment of space-related infrastructure and the potential of accelerating, by the proper use of space technology, the economic and social development of a country. In this context, the United Nations and the Government of Austria agreed to jointly organize a Workshop entitled "Enhancing social, economic and environmental security through space technology".

2. This Workshop was included in the 1994 activities of the Space Applications Programme of the United Nations Office for Outer Space Affairs and was held from 12 to 15 September 1994 in Graz, Austria. The Workshop was hosted by the Austrian Federal Ministry for Foreign Affairs, co-sponsored by the State of Styria, the City of Graz and the European Space Agency (ESA).

3. The objective of the Workshop was to show that space technology can be a powerful tool for accelerating national development and that it provides a way of overcoming obsolete technologies and an alternative to percolation and trickle-down models of national development. The application of space technology can effectively deal with problems of illiteracy, isolation and lack of information afflicting the development process. Depending upon each country's unique social, economic, cultural and resource context, and taking account of other alternative technologies, space can play an important role in specific areas of development. Participants in this Workshop were expected to apply the experience gained therein to projects, and to report to the appropriate authorities in their own countries.

4. The participants expressed their appreciation to the United Nations, the Government of Austria, the State of Styria, the City of Graz and to ESA, for sponsoring the Workshop and for the technical quality of the programme. The present report has been prepared for the Committee on the Peaceful Uses of Outer Space and its Scientific and Technical Subcommittee.

B. Organization and programme of the Workshop

5. The United Nations invited developing countries to nominate candidates to participate in the Workshop. The participants were senior technical personnel in decision-making positions who were actively engaged in projects dealing with satellite communications or Earth observations.

6. The following Member States and international organizations were represented at the Workshop: Argentina, Austria, Bangladesh, Bhutan, Brazil, Cameroon, Cape Verde, Cambodia, China, Costa Rica, France, Germany, India, Indonesia, Iran (Islamic Republic of), Italy, Mongolia, Netherlands, Pakistan, Poland, Republic of Korea, Russian Federation, Senegal, Sri Lanka, Syrian Arab Republic, Tunisia, Uganda, United Kingdom of Great Britain and Northern Ireland, United States of America, Uruguay, ESA, International Maritime Satellite Organization (INMARSAT) and the United Nations Office for Outer Space Affairs.

7. The participants were jointly selected by the sponsors and the funds allocated were used to cover the cost of international air travel, per diem and hotel expenses for the period of the meeting. The financial support provided by the sponsors enabled the participation of 42 persons in the Workshop.

8. The Workshop was formally opened by representatives of the Austrian Ministry for Science and Research, the State of Styria and the Mayor of the City of Graz. An opening statement was also made by the Director of the United Nations Office for Outer Space Affairs, N. Jasentuliyana. Keynote and theme

addresses were delivered by the Director General of the German Space Agency, B. Mennicken, and the former Chairman of the Indian Space Research Organization, U. R. Rao. The opening session was chaired by P. Hohenfellner, Chairman of the United Nations Committee on the Peaceful Uses of Outer Space. The session on space education was chaired by P. Jankowitsch, former Chairman of the Committee. R. Gibson developed the observations and recommendations to the Workshop.

9. The United Nations developed the programme (see annex to the present report) in collaboration with the Austrian Federal Ministry for Foreign Affairs and the other co-sponsors. The Workshop consisted of an integrated series of lectures, case-study presentations, discussions and exchange of views among participants, and was conducted through a series of plenary and working group sessions.

I. PRESENTATIONS TO THE WORKSHOP

A. General

10. Several papers were presented to the Workshop. Presentations focused on the applications of space technology for improving life on Earth while protecting the environment. The theme of the meeting built upon Agenda 21,[1] adopted by the United Nations Conference on the Environment and Development (UNCED), held in Rio de Janeiro in June 1992, and its recommendations for sustainable development.

11. Through technical presentations and discussions, participants addressed the issues of how to best safeguard the environment and to ensure the efficient management and sustainable development of natural resources. Applications for the exploitation of natural resources as well as for the prevention and amelioration of environmental damage were also presented.

12. Several of the presentations recommended that policy issues related to the exploitation of space technologies for sustainable development should be given a high priority in national developmental programmes.

13. The need for modern equipment and facilities was stressed. Papers also discussed ways and means of how developing countries could, through the examination and discussion of substantive projects, best utilize the experience of other countries to assist in their own development process.

14. It was stated that the growing range of space applications has brought benefits to many countries. While many developing countries use space technology, its considerable potential has not yet been fully exploited. For this reason, the international space community, and in particular countries with more advanced technology, should intensify their efforts to promote the wider exploitation of space technology by developing countries.

15. The presentations concentrated on the aspect of cooperation in using space communication and remote sensing technologies for economic and social development and environmental protection. The intersections of these new technologies with political, social, economic and environmental issues were stressed and the unique needs of the developing world and the issues for implementing them were also addressed.

B. Telecommunications

16. In the field of telecommunications reference was made to the recent advances in direct-broadcast and mobile communication services, which contain a number of technologies to increase power, signal-to-noise ratios and the rates of operation. The size and cost of ground stations has, along with major increases in the potential number of users that can be serviced and the quality and quantity of services that can be delivered,

also dropped dramatically. These new advancements are particularly important for the developing world because they either enable services that cannot be delivered by ground-based cables or microwave links, or obviate the need for costly installations of ground-based facilities.

17. It was also noted that direct-broadcast television and radio services have been available on a limited basis for several years, but will during the next few years expand significantly, with several new geostationary orbit systems being launched in both the Eastern and Western hemispheres. These satellite systems will be able to transmit to ground-based antennas as small as 45 cm in diameter, and will enable the receipt of both foreign and domestic radio and television programmes in remote and rural areas. These programmes can include information on agriculture, weather, education and training and will be provided at costs sufficiently low for relatively widespread use in developing countries.

18. Several papers examined the forthcoming generation of satellites which will utilize high-powered spot-beam geostationary orbit spacecraft and low-earth orbit multiple satellite constellations to provide full communication access by using much smaller, less expensive ground terminals as well as hand-held terminals. This new technology will be a critical tool for the developing world to overcome inadequate communication links hindering sustained development.

19. It was noted that several companies and entrepreneurs have entered the area of satellite communications, which continues to revolutionize business around the world. Similarly, many countries have established earth stations to receive satellite data and some have developed indigenous capabilities to design, build and operate their own communication systems.

20. The vast territorial limits of many countries and the inaccessibility of some areas in these countries have provided the impetus to use space-based communications to improve cooperation and information dissemination to remote and rural areas and to facilitate relief efforts in times of natural disasters. Satellite communications have been used extensively for these purposes in China, India and Indonesia.

C. Remote sensing

21. Presentations on remote sensing focused on the opportunities for using satellite data for economic growth and environmental monitoring. The development of high-resolution spacecraft was discussed as well as the currently available low-cost, high-speed and high-quality computer processing of electronic image data and the integration of remote sensing services with satellite communications and position location capabilities.

22. It was stated that the developing countries will be able to utilize new developments in remote sensing systems to gain access to significantly greater quantities of valuable data. Presentations highlighted applications in areas such as forestry, geology and mineral resources, cartography and other fields. It was emphasized that compared with conventional ground surveys, satellite observations provide less detail but much greater economy, especially when repetitive monitoring is required.

23. It was noted that large-scale phenomena or features that are not visible to a ground observer can often be identified on satellite images. Phenomena and resources that transcend boundaries can easily be observed by using remote sensing with much less logistical or administrative difficulty than is the case with ground surveys.

24. It was also stated that dynamic and subtle changes in resources and features can be measured from satellite images, which are regularly acquired by the same sensors under the same conditions. Remote sensing can provide up-to-date and accurate information, which is essential for appropriate policy formulation and effective decision-making in the developing countries.

25. With growing concern about the rapid degradation of the environment and national and regional resources, many countries have adopted remote sensing technology to suit local conditions and requirements. Remote sensing has proven to be a vital tool but there has been a great deal of duplicated effort in the developing countries. A concern that needs attention, therefore, is the establishment of effective regional mechanisms to ensure the harmonization of technical planning, operation and standardization of equipment.

26. It should be noted that the availability of a greater volume of spatial data and information from Earth observation systems underscores the need for a tool to analyse and manipulate such data for decision-making. It was noted that Geographical Information Systems (GIS) constitute such a tool and that these systems have developed into an important and indispensable instrument.

D. Space education

27. There is a need for continued long-term education in the developing world. The relevance of space science and technology to the social and economic development of a country was highlighted and it was stated that the developing countries will require assistance in undertaking space science and technology education programmes. These include the use of communication satellites for broadcasting educational programmes to rural and remote areas, the use of Earth observation satellites to conduct national resource surveys and to monitor resource exploration, as well as the use of meteorological satellites to minimize the economic and environmental impact of natural disasters such as droughts, cyclones and floods.

28. In the field of remote sensing it was noted that several countries had started acquiring systems and that many developing countries were participating in the applications of remote sensing. Moreover, some developing countries had plans to develop their own integrated indigenous programmes and a few developing countries had already developed their own systems.

29. It was stated that the need for the development of remote sensing skills and knowledge at the local level derived from their importance to economic and social development. Since the beginning of the space age, remote sensing technology and its application have steadily become more important to development.

30. Special efforts should therefore be made to initiate technical assistance programmes in order to stimulate more widespread training and education of scientists and educators in the relevant aspects of space science at all levels of society. National and international organizations and aid agencies could play a vital role in implementing this form of indigenous capability development.

31. Experiences gained by the United Nations and the International Institute for Aerospace Survey and Earth Sciences of the Netherlands in the process leading to the establishment of centres of space science and technology were presented. It was stated that an indispensable aspect of any educational programme was the availability of teachers, and that these teachers were presently not available in most developing countries.

II. OBSERVATIONS AND RECOMMENDATIONS

32. The Workshop was intended to build on Agenda 21 of UNCED. Presentations were made by leading experts from many parts of the world and ample time was available for discussion between participants and the many knowledgeable specialists from developing countries. As the title of the Workshop indicates, discussions focused on the problems connected with the application of space technology for enhancing social, economic and environmental security in developing countries. The word "security" in this context is interpreted as ensuring the sustainability of the development.

33. The Workshop programme was divided into sessions on Earth Observation, Satellite Telecommunications and Space Education. There were no parallel sessions. It was recognized from the outset, however, that there are extensive linkages between these three elements, and for this reason the emphasis has been placed on developing common recommendations relevant to each area.

34. It should be noted, moreover, that many of the points raised apply equally to developed and developing countries.

A. Common points

35. Participants agreed on the following common points:

(a) Space technology can make important contributions to improving social and economic conditions, and its potential should be recognized and better publicized;

(b) It is for developing countries to define their own needs and the services they require, not in space terms, but rather as a function of their short-term and long-term priorities and plans. This is not a "space" task, and involves inputs from a wide range of non-space disciplines;

(c) Developing countries need to be advised to seek impartial advice, to be considered against the background of their goals, before entering into new commitments involving space technology. Even well-meant gifts need to be carefully evaluated to ensure that they are compatible with the most optimal way ahead;

(d) Each developing country should have access to national or regional space competence, to help define goals and needs in order to obtain an appropriate mix of space and non-space technologies;

(e) This "space competence" does not necessarily entail having one's own satellite – it simply means being able to understand the advantages and the limitations of space technology in the search to solve practical problems;

(f) Developing countries are advised not to overlook the value of having at least a minimum level of scientific competence to underpin the use of space technologies;

(g) The national "space competence", however modest, must not be isolated. It needs constant contact with governmental user departments and ministries. Above all, success depends on a clear expression of political will to apply space techniques in solving national problems;

(h) There will be constant temptations to use the latest technologies and care must be taken to get the right mix between new and existing technologies. For Earth observation purposes, use can certainly be made of simple technology, whereas in satellite telecommunications the use of the latest technologies may be the best way to cut operating and maintenance costs and thereby reduce costs to the end user;

(i) Only in the field of meteorology is there an international organization (and regional organizations) which applies space technology. For other satellite applications, systems are provided by space agencies or by commercial entities. No international organization is geared specifically towards the needs of developing countries in this area. The lack of such an organization is a real impediment to the developing countries adequately benefiting from the possibilities provided by space technology;

(j) It is essential for developing countries to have access to information, preferably through regional centres, on what space technology is available, where and for what purposes;

(k) Regional cooperation is the most effective. A developing country will probably find more understanding of its problems from a partner within its region, and particularly from a country which has faced similar problems;

(l) Despite significant efforts in this field, training and the provision of appropriate manpower for developing countries remain a prerequisite. It must be recognized, too, that the introduction of space techniques will almost certainly entail re-training and re-deployment of existing personnel;

(m) Trained manpower and equipment will not, however, survive unless there is adequate in-country infrastructure and a commitment to use this capability where it can help;

(n) More coordination and distribution of information is required, and the existing structure does not seem adequate. For example, OOSA, regional centres etc. Reinforcement in manpower and information dissemination capacity (as recommended by UNISPACE 82) is needed, particularly on a regional basis.

B. Earth observation

36. With regard to Earth observation, the participants agreed on the following points:

(a) A mechanism is needed to bring to the attention of space agencies the specific needs of developing countries. Can this be undertaken by OOSA?;

(b) When specifying new spacecraft and ground systems, space agencies should give more consideration to the needs of developing countries, and should cooperate with aid organizations and others to identify funding to cover any additional costs which may not be compatible with the space agency's own mandate;

(c) The production of cheap, ready-to-use, Earth observation software systems should be encouraged. Products should be checked by a reputable body (perhaps OOSA). These would be useful to get more developing countries started and to enable them to demonstrate rapid results;

(d) The Committee on Earth Observation Satellites (CEOS) should expedite its actions leading to the establishment of a common format for the exchange of satellite imagery, including system-corrected, geo-coded and classified imagery. This format should be amenable for use with the most common data media, as well as for direct digital transfer;

(e) CEOS should include more specialists from developing countries in its working groups – (even) from non-member States and organizations. (The same applies to other non-governmental organizations in this field, for example, the International Astronautical Federation.);

(f) CEOS should focus on the problem of ensuring the continuity of Earth observation data archives and advising on the use of new storage techniques by operators. This is not a commercially attractive activity, but the preservation of long-term data sets is essential;

(g) Budgetary pressures will continue to cause many developed countries to transfer Earth observation activities to the private sector. This will tend to inhibit "free" access to data and technology. There is presently no international mechanism to resolve this conflict, and existing discrepancies could therefore increase;

(h) Consideration should be given to establishing a programme to provide software for remote sensing and GIS to developing countries. The software, perhaps evaluated by an independent panel, should be capable of being run on standard PC hardware platforms. Such a programme could be funded through the United Nations by contributions from interested Member States;

(i) Although some progress has been made, more effort needs to be devoted to clarifying the legal status of satellite data when offered in evidence in the courts;

(j) The United Nations initiative to establish regional centres is to be commended, but it should be made clear that it by no means reduces the continued need for assistance from the developed countries, of which the International Institute for Aerospace Survey and Earth Sciences in the Netherlands is a particularly positive example.

C. Satellite telecommunications

37. The participants agreed on the following:

(a) The link between the development of a country's telecommunications capability and the growth of gross national product is generally accepted. The latest techniques will permit developing countries to avoid the heavy investment required for conventional wired telecommunications and can rapidly produce improvements;

(b) Wireless telecommunications, including mobile satellite systems, can be a cost-effective way of connecting remote locations to the outside telecommunications network;

(c) In principle, developing countries should first upgrade international telecommunications, then trunk connections and then local systems. However, the priorities need to be set by individual countries and few will wish to progress at the expense of rural communications which often need much improvement;

(d) There will be an inevitable tendency for most efforts to be directed towards the upgrading of urban telecommunications systems. Governments must recognize the need to seek a corresponding improvement in rural areas (which will not happen automatically) to stem the population flow to urban areas;

(e) India and China have demonstrated the power of satellite systems, supported by a simple and inexpensive ground segment, to bring education to rural areas. (The techniques used in such programmes also facilitate the distribution of TV programmes of doubtful educational value, but this is an in-country problem.);

(f) There is no longer any room for satellites which make inefficient use of the scarce orbital and frequency spectrum allocations. The ability of developing countries to benefit in an appropriate manner from these scarce resources will depend on efforts to ensure a more efficient management of the resources.

D. Space education

38. The subject of space education clearly merits a separate Workshop, and it was not possible in the limited time to do it justice. However, participants agreed that the advancement of space education, i.e. education on the utilization of space techniques in combination with other new techniques, is a critical element of sustainable development programmes.

39. The Workshop demonstrated that there is a need to systematize the knowledge, experience and expertise that have been painstakingly acquired in this field, and for this to be made widely available both to

developing and developed countries. If this is not carried out, much time and money will be spent redoing something that has already been done.

40. Of primary importance, here as elsewhere, is the importance of making use of the capabilities which directly exist in developing countries, and encouraging regional pooling of experience and resources.

41. Emphasis was also placed on the creation of institutes capable of sustaining their activity, as distinct from the training of individuals, who may have difficulty in applying their newly acquired expertise. It was noted that space education is needed even at the highest decision-making levels, in order to ensure an understanding of the potential of space technology to assist in solving the problems which are the main preoccupation of ministers and senior civil servants.

Notes

[1] Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992 (United Nations publication, Sales No. E.93.I.8 and corrigenda), vol. I: Resolutions Adopted by the Conference, resolution 1, annex II.

Annex

PROGRAMME OF THE WORKSHOP

DATE/TIME	SUBJECT	SPEAKER
12 SEPTEMBER 1994		
08.30-09.00	Arrival and registration	
	Opening session, keynote and theme address	
	Chairman: P. Hohenfellner (BMfAA)	
09.00-09.40	Opening ceremony:	
	Opening statements	W. Riedler (TUG) N. Jasentuliyana (UN) J. Ortner (ASA)
	Welcoming statements	H.E. A. Stingl (Mayor of Graz) H.E. P. Schachner-Blazizek (Deputy Governor of Styria)
09.40-10.10	Keynote address: "World space cooperation at the crossroads"	J. Mennicken (DARA)
10.10-10.40	Theme address: "Space policies for developing and newly industrialized countries"	U. R. Rao (India)
10.40-10.50	Break	
	The developing world and space policies	
	Chairman: R. Kneucker (BMWF)	
10.50-11.20	Benefits of space technology for the developing world	J. Arets (ESA)
11.20-11.50	The role of the developing world in space cooperation	S. Mehmud (Pakistan)
11.50-12.20	The role of the developed world in space cooperation	R. Barnes (USA)
12.20-12.50	Discussion	

Chairman: W. Riedler (TUG)

14.30-15.00	Trends in Earth observation data and pricing policies	A. Silvestrini R. Mroczynski (EOSAT)
15.00-15.30	Cost effectiveness of satellite Earth observation data in the developing world	G. Erachet (SPOT)
15.30-16.00	International cooperation in assuring the continuity of environmental satellite data	I. Revah (France)
16.00-16.15	Break	
16.15-17.15	Discussion	

13 SEPTEMBER 1994

Remote sensing for the developing world

Chairman: U. R. Rao (ISRO)

09.00-09.30	Remote sensing for sustainable development	M. Chandrasekhar (India)
09.30-10.00	Earth observation data from space - cost, continuity and compatibility	W. Jensen (ESA)
10.00-10.15	Break	
10.15-10.45	Commercial enterprises and the production of value added remote sensing products	L. Beckel (Austria)
10.45-11.15	Remote sensing and natural resource management	A. Gagliardini (Argentina)
11.15-12.30	Discussion	
12.30-14.00	Lunch	

Technical presentations

Chairman: J. Arets (ESA)

14.00-14.30	Mapping the African rainforests	D. Mabi (Cameroon)
14.30-15.00	Application of GIS and remote sensing for integrated land-resource and land-management studies	G. Camara (Brazil)

15.00-15.30	Earth observation data and environmental protection	R. Witt (UNEP)
15.30-16.15	Discussion	
16.15-16.30	Break	
16.30-17.30	General discussion and preparation of draft recommendations	

14 SEPTEMBER 1994

Space communications and developing countries

Chairman: R. Barnes (USA)

09.00-09.30	Satellite communications: Challenges and opportunities for the developing world	P. Swan (USA)
09.30-10.00	Satellite communications for development	V. Gullá (Telespazio)
10.00-10.15	Break	
10.15-10.45	Modernization through satellite and mobile communications	D. Wright (INMARSAT)
10.45-11.15	Mass education through space technology	F. Gao (China)
11.15-12.30	Discussion	

Technical presentations

Chairman: S. Mehmud (Pakistan)

14.00-14.30	Communication services in the Commonwealth of Independent States	Y. Zubarev (Russia) V. Kotelnikov (UN)
14.30-15.00	Emerging space communications infrastructures	R. Rusin (Poland)
15.00-15.30	Communication satellite activities in the Asia-Pacific Region	S. Chung (Republic of Korea)
15.30-16.15	Discussion	
16.15-16.30	Break	
16.30-18.00	General discussion and preparation of draft recommendations	

15 SEPTEMBER 1994

Space education

Chairman: P. Jankowitsch (BMfAA)

09.00-09.20	Science and technology education: The experience in cooperating with developing countries	N. Mulder (ITC)
09.20-09.40	Space education and training in the developing countries	S. Camacho (UN)
09.40-10.00	Space education for understanding global needs	L. Stojek (ISU)
10.00-10.20	Discussion	
10.20-10.30	Break	

Report preparations

10.30-13.30	(i) Drafting group: Remote sensing (ii) Drafting group: Space communications

Presentation and discussion of recommendations

Chairman: R. Gibson (UK)

15.00-15.30	Presentation of recommendations and observations by the working groups
15.30-16.30	General discussion

Closing ceremony

16.30-17.00	Adoption of report and closing ceremony

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COMMITTEE ON THE PEACEFUL
USES OF OUTER SPACE

COORDINATION OF OUTER SPACE ACTIVITIES WITHIN THE UNITED NATIONS SYSTEM: PROGRAMMES OF WORK FOR 1995 AND 1996 AND FUTURE YEARS

Report of the Secretary-General

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United Nations Secretariat units, bodies and specialized agencies

DDSMS	Department of Development Support and Management Service of the United Nations
DHA	Department of Humanitarian Affairs of the United Nations
ECE	Economic Commission for Europe
ESCAP	Economic and Social Commission for Asia and the Pacific
ECA	Economic Commission for Africa
ESCWA	Economic and Social Commission for Western Asia
UNEP	United Nations Environment Programme
OOSA	Office for Outer Space Affairs
UNDP	United Nations Development Programme
UNITAR	United Nations Institute for Training and Research
WFP	World Food Programme
ILO	International Labour Organisation
FAO	Food and Agriculture Organization of the United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
ICAO	International Civil Aviation Organization
WHO	World Health Organization
PAHO	Pan American Health Organization
ITU	International Telecommunication Union
WMO	World Meteorological Organization
IMO	International Maritime Organization
WIPO	World Intellectual Property Organization
IFAD	International Fund for Agricultural Development
UNIDO	United Nations Industrial Development Organization
IAEA	International Atomic Energy Agency
UNSO	United Nations Sudano-Sahelian Office

ACRONYMS

ACMAD	African Centre for Meteorological Applications for Development
ADD	International Arctic Environment Data Directory
AfRICOVER	Africa Land Cover Map and Digital Geographic Database
AGRHYMET	Agrometeorology and Operational Hydrology and their Applications
AGRT	Remote Sensing and Agrometeorology Centre (FAO)
AIT	Asian Institute of Technology
AMAP	Arctic Monitoring and Assessment Program
APSCC	Asia-Pacific Satellite Communications Conference
ASEAN	Association of South-East Asian Nations
AVHRR	advanced very high resolution radiometer
BBS	Bulletin Board Systems
BDT	Telecommunication Development Bureau (ITU)
BEAMSAT	Basic Elements Automated Monitoring Satellite (ECE)
BR	Radiocommunication Bureau (ITU)
BSS	International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources
CAF	Corporación Andina de Fomento
CAgM	Commission for Agricultural Meteorology (WMO)
CARICOM	Caribbean Community
CARS	Climate Applications Referral System (WMO)

CAS	Commission for Atmospheric Sciences (WMO)
CEOS	Committee on Earth Observations Satellites
CILSS	Comité Interétats de Lutte Contre la Sécheresse au Sahel
CMM	Commission for Marine Meteorology (WMO)
CNS/ATM	Communications, navigation and surveillance/air traffic management
COMEMIS	Coastal and Marine Environment Management Information System
COSPAS-SARSAT	International Satellite System for Search and Rescue
CRTEAN	Centre régional de télédétection des états de l'Afrique de Nord
CRTO	Centre Régional de Télédétection de Ouagadougou
DANIDA	Danish International Development Agency
DC/PAC	Desertification Control Programme Activity
DCP	data collection platform
DIANA	Data and Information Available Now in Africa (FAO)
DDC	Investment Centre (FAO)
EAP	Environment Assessment Programme (UNEP)
EC	European Community
ECDIS	Electronic Chart Display and Information System
ECZ	Environmental Council of Zambia
EIS	Environment Information System
ELMS	Environment and Land Management Sector
EMPRES	Emergency Prevention System
ENRIN	Environment and Natural Resource Information Networks (UNEP)
EOS	Earth Observation Sciences (United Kingdom)
EOSAT	Earth Observation Satellite Co.
EPIRB	Emergency Position-Indicating Radiobeacon
EROS	Earth Resources Observation Systems
ERS-1	Earth Resources Satellite-1 (ESA)
ESA	European Space Agency
ESRIN	European Space Research Institute (ESA)
EU	European Union
FINNIDA	Finnish International Development Agency (Finland)
FPLMTS	Future Public Land Mobile Telecommunication Systems (ITU)
FRA	Global Forest Resources Assessment (FAO)
GARS	Geological Applications of Remote Sensing (UNESCO)
GAW	Global Atmosphere Watch (WMO)
GCIP	GEWEX Continental-scale International Project (WCRP)
GCOS	Global Climate Observing System (UNEP/IOC/WMO)
GEWEX	Global Energy and Water Cycle Experiment (WCRP)
GIEWS	Global Information and Early Warning System on Food and Agriculture (FAO)
GIS	Geographic Information System
GLONASS	Global Orbiting Navigation Satellite System
GNSS	Global Navigation Satellite System
GMDSS	Global Maritime Distress and Safety System
GOES	Geostationary Operational Environmental Satellite (U.S.)
GOOS	Global Ocean Observing System (IOC)
GPS	Global Positioning System
GRID	Global Resource Information Database (UNEP)
GSO	Geostationary Satellite Orbiter
GTOS	Global Terrestrial Observing System
GTZ	Gesellschaft für Technische Zusammenarbeit

HRPT	high resolution picture transmission
IACC	Inter-Agency Consultative Committee (RASCOM)
IAHS	International Association of Hydrological Sciences
ICC	Intergovernmental Consultative Committee (ESCAP)
ICIMOD	International Centre for Integrated Mountain Development
ICPIC	International Cleaner Production Information (UNEP)
ICRISAT	International Crop Research Institute for the Semi-arid Tropics
ICRP	International Commission on Radiological Protection
ICSU	International Council of Scientific Unions
IGADD	Intergovernmental Authority on Drought and Development
IGBP	International Geosphere-Biosphere Programme (ICSU)
IGN-FI	Institut Géographique National-France international
IGOSS	Integrated Global Ocean Service System (IOC/WMO)
IHO	International Hydrographic Organization
IHP	International Hydrological Programme
INFOCLIMA	climate data information referral system (WMO)
INFOTERRA	International Referral Service for Sources of Environmental Information (UNEP)
INMARSAT	International Maritime Satellite Organization
INPA	National Institute for Research in the Amazon (Brazil)
INPE	Institute for Space Research (Brazil)
INSROP	International Northern Sea Route Programme
IOC	Intergovernmental Oceanographic Commission (UNESCO)
IODE	International Oceanographic Data and Information Exchange (IOC)
IOS	Initial Operational System (JSTC)
IP	image processing
IPDC	International Programme for the Development of Communication
IRRI	International Rice Research Institute
ISCCP	International Satellite Cloud Climatology Project (WCRP)
ISDN	integrated services digital network
ISRIC	International Soils Reference and Information Centre
IUCN	International Union for Conservation of Nature and Natural Resources
IUFRO	International Union of Forestry Research Organisations
IUGS	International Union of Geological Sciences
J-GOOS	Joint Scientific and Technical Committee for GOOS (IOC/WMO/ICSU)
JPO	Joint Planning Office (UNEP/IOC/WMO)
JRC	Joint Research Centre (EU)
JSTC	Joint Scientific and Technical Committee (UNEP/IOC/WMO)
JUNAC	Junta del Acuerdo de Cartagena
LAC	local area coverage
LIS	LANDSAT Information System (ECA)
MAB	Man and the Biosphere (UNESCO)
MAE	Multi-Andean Enterprise
NASA	National Aeronautics and Space Administration (U.S.)
NASDA	National Space Development Agency (Japan)
NDVI	normalized difference vegetation index
NEA	Nuclear Energy Agency (OECD)
NEIC	National Environment Information Centre (Uganda)
NEMC	National Environment Management Council (Tanzania)
NEPA	National Environment and Protection Agency (China)
NIES	National Institute of Environmental Studies (Japan)
NOAA	National Oceanic and Atmospheric Administration (United States)

NOWPAP	NW Pacific Action Plan
OCA/PAC	Oceans and Coastal Areas Programme Activity Centre (UNEP)
OECD	Organisation for Economic Co-operation and Development
OLIVIA	Operational Low-Cost Integrated Vital Information Access (FAO)
OSS	Observatoire du Sahara et du Sahel
ORSTOM	Institut français de recherche scientifique pour le développement et coopération (France)
PAC	Programme Activity Centre (UNEP)
PANA	Pan-African News Agency
PANAFTEL	Pan-African Telecommunication Network
PSMP	Programme on Short- and Medium-range Weather Prediction Research (WMO)
PSN	data packet switching network
RAMSES	Reconnaissance and Management System of the Environment of Scmistocera (FAO)
RASCOM	Regional African Satellite Communication Organization
RCSSMRS	Regional Centre for Services in Surveying, Mapping and Remote Sensing (ECA)
RECTAS	Regional Centre for Training in Aerospace and Surveys (ECA)
RESPAS	Remote Sensing Processing and Archiving System for Forest Assessment and Monitoring (FAO)
RJGC	Royal Jordanian Geographic Centre (Jordan)
RMTN	Regional Meteorological Telecommunication Network (WMO)
ROE	Regional Office of Europe (UNEP)
ROSELT	Réseau d'Observatoires Ecologiques à Long Terme
RRSP	Regional Remote Sensing Programme (ESCAP)
SACEP	South Asia Co-operative Environment Programme
SADC	Southern African Development Community
SAR	synthetic aperture radar
SCOPE	Scientific Committee on Problems of the Environment
SCF	Save the Children Fund (United Kingdom)
SOLAS	International Convention for the Safety of Life at Sea
SOTER	Soils and Terrain database (UNEP)
SPREP	South Pacific Regional Environment Programme
SPOT	Satellite Pour l'Observation de la Terre (France)
TCDC	technical cooperation among developing countries
TELECOMs	Telecommunication Exhibitions and Forums
TM	Thematic Mapper (LANDSAT)
TMRP	Tropical Meteorological Research (WMO)
TREES	Tropical Ecosystem Environment Observations by Satellite (EC)
TSB	Telecommunication Standardization Bureau (ITU)
UNCED	United Nations Conference on Environment and Development
USAID	United States Agency for International Development
US EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VCP	Voluntary Co-operation Programme (WMO)
VSAT	very small aperture terminal
WARC	World Administrative Radio Conference
WCASP	World Climate Applications and Services Programme (WMO)
WCDMP	World Climate Data and Monitoring Programme (WMO)
WCMC	World Conservation Monitoring Centre
WHYCOS	World Hydrological Cycle Observing System (WMO/World Bank)
WOCE	World Ocean Circulation Experiment (WCRP)
WRC	World Radiocommunication Conference

WRI	World Resources Institution
WTDC	World Telecommunication Development Conference
WWW	World Weather Watch (WMO)

INTRODUCTION

1. The present report has been prepared by the Secretary-General at the request of the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space and concerns efforts at coordinating the activities of organizations within the United Nations system that relate to assistance to developing countries in the practical application of space technology.*

2. The report is based on the contributions submitted by the organizations concerned in response to the United Nations request for information on concrete programmes of work envisaged primarily for 1995 and 1996, and was reviewed in its draft form at the Inter-Agency Meeting on Outer Space Activities, held at the United Nations Office at Vienna, from 3 to 5 October 1994.

3. The report consists of three sections: section I contains a list of the participants in outer space activities within the United Nations system. A matrix of outer space programmes is also provided to identify the activities of each participant in specific fields. Section II presents a summary of major activities and programmes planned for 1995 and 1996 and future years by the organizations within the United Nations system as a whole. Section III presents concrete activities or programmes planned by individual organizations in an integrated form under substantive headings such as remote sensing, communications and navigation, meteorology, hydrology, space science, safety aspects as well as other activities in the field of space science, and technology and its applications.

4. There are three subheadings - education and training programmes, expert services and survey missions, and dissemination of information - under each of the headings of remote sensing, communications, and meteorology and hydrology. Concerning the last one of the subheadings, more efforts are being made within the United Nations system to develop databases to disseminate information with increased accuracy, quantity and speed. In the present report, the activities related to the establishment or development of databases are categorized as the studies on or implementation of pilot projects while those related to the operation of databases, after the development phase is completed, are categorized as the dissemination of information.

5. Valuable information on space technology or on operational systems can also be disseminated at meetings or conferences where decision makers in space activities exchange their opinions and may elaborate strategies or plans for future activities. Since such meetings or conferences lack educational or training purposes, they are also categorized as the dissemination of information, rather than educational and training programmes.

6. For the remote sensing and Geographic Information System (GIS) activities, there are two more subsections, "establishment of centres for space science and technology education" and "capacity building", reflecting the increased efforts for the development of indigenous capability in space science and technology in developing countries.

7. Also for the activities in the field of communication, two additional subsections to describe the efforts in the United Nations system concerning the legal aspects. One concerns the regulation of the use of the geostationary satellite orbit and the radio-frequency spectrum allocated to space communication services. The other subsection describes the efforts towards the establishment of new legal frameworks or the development of new technological systems to complement the existing legal frameworks.

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*This is the twentieth such annual report. The first 19 reports were contained in documents A/AC.105/166, 183, 201, 223, 242 and 278, A/CONF.101/BP.11/Add.1, A/AC.105/309 and Corr.1, A/AC.105/345, 342, 359, 373, 389, 415, 444 and Corr.1, 465 and Corr.1, 491 and Corr.1, 524 and 551.

I. PARTICIPANTS IN OUTER SPACE ACTIVITIES WITHIN THE UNITED NATIONS SYSTEM AND MATRIX OF OUTER SPACE PROGRAMMES

8. The participants in outer space activities within the United Nations system included the following Secretariat units, bodies, research institutes, specialized agencies and other organizations: Office for Outer Space Affairs, Department of Development Support and Management Service, Department of Humanitarian Affairs, United Nations Environment Programme, Economic Commission for Africa, Economic Commission for Europe, Economic and Social Commission for Asia and the Pacific, United Nations Development Programme, United Nations Institute for Training and Research, Food and Agriculture Organization of the United Nations, United Nations Educational, Scientific and Cultural Organization, United Nations Industrial Development Organization, International Civil Aviation Organization, World Health Organization, International Telecommunication Union, World Meteorological Organization, International Maritime Organization, World Intellectual Property Organization, World Bank and International Atomic Energy Agency.

9. A matrix of outer space programmes within the United Nations system is presented below.

II. SUMMARY OF MAJOR ACTIVITIES AND PROGRAMMES PLANNED FOR 1995 AND 1996 AND FUTURE YEARS

10. The organizations within the United Nations system have planned activities for 1995 and 1996 and future years within the fields of remote sensing and GIS, communications and navigation, meteorology and hydrology. Valuable space-related or -aided activities in basic space sciences, improvement of safety and other activities related to space science and technology and its applications will also be conducted by the organizations within the United Nations system.

11. The planned activities range from education and training to operational applications of technologies. Three categories of activities are notable in most of the above fields of space activities. The first type to be noted is the education and training programmes which are generally offered through the organization of training courses, workshops and seminars or the fellowship support. Efforts are made within the United Nations system also to improve the educational and training environment by establishing new facilities or providing educational tools.

12. Secondly, organizations within the United Nations system provide expert services and conduct survey missions to identify specific areas of applications relevant to a given country or group of countries. Specific studies on pilot projects in the country or the group of countries are also being conducted. In recent years there has been increasing emphasis on maximizing the benefits from space activities for social and economic development through the operational applications of existing space technologies. A number of projects with such emphasis are carried out at regional or global level.

13. Thirdly, dissemination of information on the status of technology or on the operational systems has always been an important element in space activities. Organizations within the United Nations system issue numerous recurrent or non-recurrent publications, describing the emerging new space technologies and suggesting their possible applications. Various data obtained by means of space technologies are also widely distributed.

14. In the field of remote sensing, the United Nations and its specialized agencies have planned a number of international, regional and national training courses and workshops. They cover remote sensing applications in general as well as specialized topics such as the monitoring and control of the desert environment, sustainable development of natural resources and energy, natural resources and environment

PARTICIPANTS IN OUTER SPACE ACTIVITIES AND MATRIX OF OUTER SPACE PROGRAMMES*

	Remote sensing	Communications and navigation	Meteorology and hydrology	Basic space science	Safety aspects	Other applications
OOSA	28,37,47-49,68,139-140, 163-164	176,179-180,190-191	209	243-245		255-258
DDSMS	48,92					
DHA	69-70					
UNDCP	68,112					
UNEP	53-56,71-90,105,121,124, 129,138,141-151,167-172	183-184,192-193	204,212-213,217-221, 225,235	246		
ECA	29-32,38,39,43,50-51, 91-98,119,152-154,161, 164-165	184,198	205,222			
ECE	99					
ECLAC	164					
ESCAP	33,40,41,44,52,79(b),100, 121,155-158,162,164, 170(c-viii,d,f)					
ESCWA	164		213			
UNDP	33,40,138,162,168,169(f), 170(c-iii,d,e)		211,216			
UNITAR	32(g),(h),111(c),168, 169(b-d)					
FAO	34,42,45,57-68,72,75,82, 89,93,98,101-126,130, 138,143,159,166,168, 169(f),173-175	183-185	214-215,218,223-225		252	
UNESCO	35,80,124,127-134,160	181,187,197-198	206-207,210,218, 225-226,228-229,235, 237,239,241			
UNIDO						259-260
ICAO		201,203				
WHO	171				252	
ITU		177,182,188,194-196	238		247-249,251	
WMO	134,168	178	208,211,216,218,220, 225,227-235,239-242		251	
IMO		202-203			249-251	
WIPO		189,197,199-200				
World Bank	36,46,120,135-138		216(a),234			
IAEA					252-254	

*The numbers in each column indicate the relevant paragraphs in the present report.

management, vegetation, forest and environment assessment, land-cover mapping and the early warning systems for food security. Most of these international and regional training courses are jointly organized by two or more organizations within the United Nations system, often in cooperation with other international organizations and/or Governments.

15. Many of the organizations of the United Nations will offer expert services in their respective areas of competence and carry out pilot projects with the use of remote sensing technologies and GIS. Indeed, these technologies are applied to a wide range of activities, such as natural resources and environment assessment and management, monitoring of natural resources and natural disasters, early warning for food security, land management, forest planning and management, mapping of desertification, monitoring of cultural sites and pest disease control. A number of projects by the organizations of the United Nations are aimed at establishing databases or information networks at regional or global level, such as Africa Land Cover Map and Digital Geographic Database (AfRICOVER), Africa Real Time Environmental Monitoring Information System (ARTEMIS), Operational Low-cost Integrated Vital Information Access (OLIVIA) programme, Geological Applications of Remote Sensing (GARS) project and Global Environment Monitoring System (GEMS), to list a few.

16. In the area of the dissemination of information, organizations either provide information upon request or issue recurrent or non-recurrent publications concerning technological status or existing operational systems to increase awareness of the useful applications of remote sensing technologies. Reflecting the development in the information technology, more information is being distributed through computer networks, which in turn stimulates demand for the further development of databases. It should be noted that expert or decision-maker meetings organized within the United Nations system also provide essential opportunities to exchange updated technological or policy-related information which will be vital in determining the regional or global strategies for social and economic development with the use of remote sensing technologies.

17. Under the efforts for the establishment of centres for space science and technology education, all the evaluation missions to establish regional centres in Africa, Latin America and the Caribbean, Western Asia, and Asia and the Pacific have already been conducted. Much progress has been made in each of the above regions towards the establishment of the regional centres with the cooperation of regional commissions and other interested organizations within the United Nations system. It has been announced that the Centre for Space Science and Technology Education in Latin America and the Caribbean should be established in Brazil and Mexico.

18. There will be more activities within the United Nations system with the particular objective of capacity building in developing countries with the use of remote sensing and GIS technologies. Most of the efforts are directed towards the strengthening of operational capability of existing regional or national institutions involved in environmental management for sustainable development, natural resources monitoring or land-cover mapping. Development of human resources is also considered an important factor.

19. In the field of communications and navigation, efforts are also being made to organize a training course and workshops and to provide fellowship support. As far as expert and technical advisory services are concerned, organizations within the United Nations system participate in the development of domestic or regional satellite communication systems for various purposes such as improvement of distance education, increase of public awareness in environmental protection and supplement of early warning systems for food security. Satellite communication systems are also considered a vital tool for social and economic development, as demonstrated by the Regional African Satellite Communication Organization (RASCOM) project. Satellite communications systems are also used to improve the communications between the headquarters and the regional offices, or among the regional offices, of the organizations. The Data and Information Available Now in Africa (DIANA) project and MERCURE are such examples.

20. The results or interim reports of the projects or studies conducted within the United Nations systems are also available in the forms of recurrent or non-recurrent publications or digitized data to be disseminated through computer networks.

21. Various studies are being carried out to examine the technical constraints associated with radio-frequency allocations and related provisions for space radiocommunications below 3 GHz with a view to facilitating the use of those frequency bands. Efforts are also being made towards the establishment of new legal norms or the development of new technological systems to complement the existing legal framework. Examples of such include the enforcement of intellectual property rights, including copyrights and development of a new system in the interest of international civil aviation.

22. The work of the specialized agencies of the United Nations is also making significant contributions in the areas of applications of space technology for land, maritime and aeronautical mobile communications. Studies on a world-wide radio-navigation system are being conducted within the United Nations system. While the Global Positioning System (GPS) and the Global Orbiting Navigation Satellite System (GLONASS) are regarded as candidate systems, consideration is also given to a post GPS/GLONASS.

23. The application of satellite technology forms an important element of technical cooperation activities in both meteorology and operational hydrology. A series of workshops, training courses and fellowship programmes are planned for 1995 and 1996 to discuss the subjects of satellite meteorology, tropical meteorology, hurricane forecasting and marine-related remote sensing activities, among many others.

24. Through the provision of expert services, efforts are made to develop or carry out comprehensive hydrological and hydrogeological surveys of surface and groundwater resources, to upgrade meteorological observations by installing data collection platforms and to improve the meteorological telecommunication system by planning the implementation of a regional meteorological telecommunication network in various regions. Reflecting the increasing awareness of the climate changes, organizations within the United Nations system also cooperate in the global schemes, such as the Global Climate Observing System, Global Terrestrial Observing System (GTOS), Global Atmosphere Watch, World Climate Programme and World Climate Data and Monitoring Programme. A series of technical reports on climate research and ocean observations, as well as water-resource management, are also published.

25. In basic space sciences, the United Nations planned a workshop which was held at Cairo, Egypt, from 27 June to 1 July 1994. Similar workshops are being planned in the regions of Asia and the Pacific and of Europe in the coming years. Selected presentations and lectures delivered at the workshops are published on a yearly basis. Furthermore, the United Nations, through its Programme on Space Applications, will continue to collaborate with the committee on Space Research (COSPAR) to support the space research activities of scientists from developing countries.

26. Organizations within the United Nations system also make efforts towards the improvement of safety in various human activities. While studies are under way to apply space technology to establish safety systems, such as the Global Maritime Distress and Safety System, consideration is given also to emerging risk and danger as a result of expanding space activities, such as the risk of the use of nuclear power sources in outer space. Space technology can be a solution for safety in many aspects. Conversely, space activities may create a risk which should be dealt by various organizations.

27. The sphere of space activities carried out by the organizations within the United Nations system is rapidly expanding both vertically, from education to operational applications, and horizontally, covering various fields. While each organization develops its own projects and may increase the number of activities to be conducted within its mandate, in the wake of restructuring and reorganization within the United Nations system to increase efficiency and effectiveness, it is becoming more important to find areas of cooperation

and coordination with other organizations. This report describes the space activities of the organizations within the United Nations system. It is hoped that the report will be of help in finding directions for the improvement of coordination of the activities to maximize the benefits from space science and technology for all the countries.

III. ACTIVITIES PLANNED BY ORGANIZATIONS WITHIN THE UNITED NATIONS SYSTEM FOR 1995 AND 1996 AND FUTURE YEARS

A. Remote sensing and the Geographic Information System

1. Education and training programmes

Training courses, workshops and seminars

28. The United Nations Programme on Space Applications is planning the following training courses, workshops and seminars in 1995 and 1996:

(a) The Fifth United Nations Training Course on Remote Sensing Education for Educators, to be hosted and co-sponsored by the Government of Sweden, Stockholm, Sweden, May-June 1995;

(b) A United Nations Workshop on the Use of Space Techniques for Monitoring and Control of the Desert Environment for the Benefit of Member States in the Region of ESCWA, 1995;

(c) A United Nations/International Astronautical Federation (IAF) Symposium on Space Technology in Developing Countries during the Forty-sixth Congress of IAF, 1995;

(d) A United Nations Training Course on the Monitoring of Natural Resources, Renewable Energy and Environment Using the Data from Earth Resources Satellite-1 (ERS-1), to be organized jointly with the Department for Development Support and Management Services of the United Nations and the European Space Agency (ESA), and held at the European Space Research Institute (ESRIN), Frascati, for the benefit of ESCAP member States, Frascati, Italy, in April 1995.

29. ECA will organize in the first quarter of 1995 a regional seminar on sustainable development of natural resources and energy, taking into account environmental concerns with Agenda 21.[1] The seminar will comprise special sessions on resource information needs and how satellite imagery coupled with GIS can fill the most pressing information gaps of African member States. It is envisaged including similar seminars in the work programme for the biennium 1996-1997.

30. The Regional Centre for Training in Aerospace and Surveys (RECTAS) will continue to offer long-term training courses ranging between 10 and 18 months as appropriate for the three levels of technician, technologist and postgraduate for both photogrammetry and remote sensing in English and French for African members of ECA.

31. RECTAS (ECA) is planning for 1995 a GIS/LANDSAT Information System workshop for surveyors and decision makers in collaboration with the Federal Surveys of Nigeria and Switzerland, Leica, Sweden, and the Federal School of Surveying, Oyo, Nigeria.

32. The following training courses, workshops and seminars are being planned by the Regional Centre for Services in Surveying, Mapping and Remote Sensing (RCSSMRS/ECA) for the years 1995 and 1996:

(a) Regional seminar to be organized in cooperation with Canada Centre for Remote Sensing, from 23 to 28 January 1995; during the seminar, the results of the GlobeSAR research project will be presented;

(b) Workshop/Seminar on the Applications of Remote Sensing for Natural Resources Assessment, Monitoring and Management, from 13 to 17 March 1995, Kampala, Uganda;

(c) Three-week course on remote sensing and GIS applications for early warning systems for food security, Nairobi, Kenya, in May 1995;

(d) Course on Earth Resources Satellite-1 (ERS-1)/Satellite Pour l'Observation de la Terre (SPOT) Data for Vegetation, Forest and Environmental Assessment, to be organized in cooperation with France and ESA, Nairobi, Kenya, during August 1995;

(e) Course on effective application of GIS for natural resources planning, during October 1995;

(f) Workshop on synthetic aperture radar application for the Eastern and Southern African region, to be organized in cooperation with Canada Centre for Remote Sensing, in December 1995; the workshop is within the GlobeSAR research activities;

(g) From four to six short-term training courses to address applications of remote sensing and GIS for effective natural resources assessment and management, to be organized in cooperation with UNITAR and the International Institute for Aerospace Survey and Earth Sciences (ITC) throughout 1996, within the framework of an agreement with the two organizations; the courses are aimed at strengthening capacities in Africa;

(h) Training courses planned in cooperation with FAO within the framework of the AfRICOVER project:

(i) Short-term training courses in remote sensing and GIS planned to be developed with UNITAR and OSS to cover 1995 and 1996 and beyond; the establishment of an e-mail system for the RCSSMRS is included in this plan;

(ii) Short-term training courses on remote sensing and GIS for environmental information analysis, dissemination and management, planned to be developed with ITC.

33. The following training courses, workshops and seminars are being planned by ESCAP in 1995 and 1996 with major funding support from UNDP and co-financing and cost sharing by member States and other donors:

(a) Seminar-cum-hands-on-training to introduce integrated applications of GIS/remote sensing for ecosystem management in Viet Nam in August 1995;

(b) Hands-on training for users (including technical personnel in government development planning) on GIS/remote sensing in April 1996;

(c) Workshop on Remote Sensing and GIS for Land and Marine Resources and Environment Management, Beijing, China, in February 1995;

(d) Meeting/workshop to introduce and promote different aspects of GIS/remote sensing technologies for integrated natural resources and environmental management, Bangladesh, in June 1996;

(e) Workshop/seminar for senior planners and managers/decision makers to disseminate information on the operational uses of remote sensing and GIS for integrated natural resources planning, environment management and development planning in China in February 1996;

(f) Medium-term training course on GIS/remote sensing for land use planning, from technical cooperation for developing countries, in Indonesia in July 1995.

34. FAO plans to organize or co-organize the following remote sensing training courses, workshops and seminars in 1995 and after:

(a) FAO/European Union (EU)/ESA in cooperation with Telespazio, Italy, fourth subregional workshop for decision makers on agricultural and environmental applications of remote sensing and GIS, Bulgaria, in 1995;

(b) Decision makers workshop on agricultural and environmental monitoring, in cooperation with ECA, Africa, at the end of 1995;

(c) FAO/German Foundation for International Development (DSE) regional training course on applications of remote sensing and GIS in managing tropical forest and conserving natural resources in Latin America, for one month; dates and venue to be determined in 1995;

(d) FAO regional training course on applications of remote sensing and GIS to aquaculture in Africa, for two weeks; dates and venue to be determined in 1995;

(e) FAO expert consultation on workshop for decision makers for the use of remote sensing and GIS techniques, Rome, in 1995;

(f) FAO/DSE Germany regional training courses on applications of remote sensing and GIS in managing tropical forest in South-East Asia and Latin America, in 1996; dates and venue to be determined;

(g) FAO technical workshops on landcover mapping, in the framework of the AfRICOVER project, dates and venues to be determined with ECA and African regional remote sensing centres, in 1995, 1996 and 1997;

(h) FAO expert consultation on the use of remote sensing and agrometeorology for agricultural statistics, Rome, in 1995 or 1996.

35. In the next few years, UNESCO will support the following postgraduate training courses dealing with the applications of remote sensing to integrated natural resources research, management and development:

(a) Postgraduate course in integrated study and rational use of natural resources at the universities of Paris, Montpellier and Toulouse, France;

(b) International postgraduate training courses on remote sensing applications, digital image processing and aerospace surveys for applied geomorphology and engineering geology at the International Institute for Aerospace Survey and Earth Sciences, Enschede, Netherlands;

(c) An international postgraduate training course on photo-interpretation applied to civil engineering and to geology will be given at the Instituto Geográfico Agustin Codazzi, Santa Fe de Bogotá, Colombia.

36. In 1995-1996 and beyond, the World Bank will conduct staff training programmes, workshops and seminars with a view to promoting the technology internally in the area of remote sensing and GIS technology.

Fellowships

37. In promoting the development of indigenous capability, the United Nations Programme on Space Applications, with the assistance of Brazil, China and ESA, will award long-term fellowships for the in-depth training of participants from developing countries in the areas of research and applications in remote sensing technology; research and training in geodesy, photogrammetry and remote sensing; space antennas and propagation; remote sensing information systems; and remote sensing instrumentation.

38. ECA, in support of human resources development in remote sensing and GIS in Africa, will continue to solicit fellowships from the agencies within the United Nations systems as well as from other donor countries and agencies.

39. RECTAS (ECA) will continue to provide student fellowships to ECA member States through Dutch and French technical assistance.

40. ESCAP will organize advanced training for up to 18 professionals to become trainers in general principles and applications of GIS/remote sensing through advanced-level fellowship studies. There will be at least six fellowships each year in 1995, 1996 and 1997. The training will be arranged by participating countries on a cost-sharing basis with the ESCAP/UNDP-funded project on GIS/remote sensing (RAS/92/070). Fellowships will be provided by the host Governments, and international travel and miscellaneous expenses will be covered under the RAS/92/070.

41. Study tours will be organized by ESCAP during which up to 12 scientists will visit remote sensing/GIS facilities in China, India and Thailand in 1995, 1996 and 1997. International travel and miscellaneous expenses will be covered under RAS/92/070 while accommodation in the above three countries will be provided by the host Government.

42. FAO will continue providing fellowships and organizing study tours within the framework of remote sensing technology transfer activities of field projects in 1995-1996.

Provision of training materials or facilities

43. RCSSMRS (ECA) plans to complete its capital development in the period 1995-1996. This includes completion of Block-C, which will house offices, workshops and training halls.

44. ESCAP will conduct studies and surveys to prepare the following training materials, guidelines and inventories on regional remote sensing and GIS development:

(a) A training manual for planners and decision makers on applications of GIS/remote sensing to natural resources and environmental management in 1995-1996;

(b) A set of guidelines for the standardization and implementation of GIS for development planning in 1995-1996;

(c) A compendium on space development applications for development in the ESCAP region.

45. Within FAO, the Land and Water Division collaborates with the Remote Sensing Centre and other relevant services on the development of computer-based tools for analysing and disseminating remote sensing data and information products in the organization of seminars, training courses and workshops.

46. For the region of Asia, the World Bank has established a small computer facility for image processing and spatial analysis in the Asia Technical Department, Technology Division (ASTTP), which now maintains a number of complete personal computer work stations capable of providing image processing and GIS functional support. The objective of this project is to establish in the period 1995-1996 an easily accessible facility where project staff can learn about the use of satellite images and digital mapping in a non-intimidating computer environment. ASTTP facilities are available also to other World Bank regions. Similar activities are expected to be developed in other regions in the future.

2. Expert services and survey missions to identify specific areas of applications relevant to a given country or group of countries and to carry out specific studies on pilot projects or to implement the projects with operational applications of technology

Provision of expert services and survey missions

47. The United Nations Programme on Space Applications has made further progress in promoting cooperation between Ecuador and the countries that are within the coverage area of the Cotopaxi Ground Receiving Station. After the conclusion of the mission to the Andean subregion in 1993 in order to make the Cotopaxi station viable to all countries within its coverage area, a report was submitted to the Governments of the four countries (Colombia, Ecuador, Peru and Venezuela) visited by the mission as well as to Junta del Acuerdo de Cartagena (JUNAC), Corporación Andina de Fomento (CAF) and the Caribbean Community (CARICOM) for their consideration. On the basis of this report, CAF recently approved funds to finance the feasibility study and other substantive action necessary for the establishment of the Multi-Andean Enterprise (MAE), within which the Cotopaxi station will operate. The Programme continues to contribute to that feasibility study.

48. The Programme on Space Applications, in cooperation with the Department of Development Support and Management Service of the United Nations (DDSMS) and ESA, is conducting a survey of the needs for satellite-acquired remote sensing data by ongoing or planned projects in the Africa and Latin America and Caribbean regions. A fact-finding mission has already met with representatives of interested institutions in the ECLAC region, and a similar mission is being planned for Africa in November 1994. The findings of these missions will be utilized to integrate a project that would make satellite-acquired data available and would provide training on the use of those data in both regions.

49. The Office for Outer Space Affairs continues to provide support to the Government of Chile, at the request of the latter, in its follow-up activities, as pro tempore secretariat, of the recommendations of the Second Space Conference of the Americas, which was held at Santiago from 26 to 30 April 1993 (A/AC.105/551, para. 44). At the request of the Government of Uruguay, which will host the Third Space Conference of the Americas, the Office for Outer Space Affairs is prepared to provide any necessary support to the Government.

50. ECA will emphasize the provision of technological and administrative support to its sponsored regional training and service remote sensing centres. In this context, full support has been given to the establishment of a portable ground receiving station at the RCSSMRS at Nairobi, Kenya, during the first quarter of 1995, to cater for the needs of high resolution earth observations satellite data of the Eastern African subregion while a permanent station is established. It is also expected that a smaller portable station will be installed in the central African subregion during 1995. ECA will continue its efforts in pursuance of the harmonization

and rationalization of the regional centres, where the merging of Centre Régional de Télédétection de Ouagadougou and RECTAS (ECA) has been contemplated as a logical and necessary step.

51. The RCSSMRS (ECA) intends to acquire computer hardware, software and laboratory equipment to strengthen its services to users in the region in 1995 and 1996.

52. ESCAP staff members will provide the following technical and advisory services to the region:

(a) Technical advisory service/consultative missions will be undertaken in the member countries on the use and applications of GIS/remote sensing in integrated natural resources and environment management; approximately, 8-10 such missions will be conducted each year in 1995 and 1996 at the request of the member countries;

(b) Consultative meetings with missions to donor agencies will be conducted to arrange the cost sharing and co-financing of regional GIS/remote sensing activities during 1995 and 1996.

53. UNEP through the Global Resource Information Database (GRID)-Sioux Falls has carried out a biennual comprehensive survey of GIS and image processing software systems for 1993. The first survey was carried out for the baseline year 1991, and the report was widely distributed within the United Nations system and developing countries. The activity will be repeated every two years to provide up-to-date information to member countries.

54. UNEP, through its GRID Programme Activity Centre, is sponsoring jointly with UNESCO an expert consultation to examine the needs and to review the modalities for the establishment of an Arab Environmental Information Network to include remotely sensed data. A series of country visits are being consolidated into a regional overview.

55. UNEP-GRID cooperating centres in Poland (GRID-Warsaw) and in Brazil (GRID-São José dos Campos) will continue to play a significant role in solving national environmental problems using remote sensing technology and GIS. Provision of technical services by GIS specialists and remote sensing tools, provision of on-line data services in Brazil and reporting support in connection with the State of Environment in Poland were notable contributions in 1994.

56. UNEP will, through GRID-Arendal, assist the International Northern Sea Route Programme with an information system for environmental assessment.

57. The FAO Remote Sensing, Agrometeorology and GIS Centre annually provides technical support, including advisory services, formulation, backstopping and evaluation of field projects to about 50 developing countries in Africa, Asia, Latin America and the Caribbean and in central and eastern Europe. In addition, FAO provides support to the International Fund for Agricultural Development (IFAD) and the World Food Programme (WFP) for their field project activities.

58. FAO will continue to cooperate with United Nations regional economic commissions and regional remote sensing centres in the efficient use of appropriate remote sensing technology for the mapping, assessment and monitoring of renewable natural resources and natural disasters. The priorities of this assistance will follow the Agenda 21 recommendations of the United Nations Conference on Environment and Development.

59. FAO will continue its assistance to the Government of Afghanistan in preparing for the rehabilitation of the agricultural sector through an inventory of current land utilization based on satellite remote sensing

and GIS technologies. Such assistance will also be provided to the Islamic Republic of Iran. Similar projects have been prepared for the Libyan Arab Jamahiriya and Mozambique.

60. FAO will implement phase II of its regional remote sensing/food security early warning project for the Southern African Development Community countries, with possible funding by the Government of the Netherlands, and is exploring the continuation of its sister project for the countries of the Intergovernmental Authority on Drought and Development.

61. FAO continues to assist the Government of Buenos Aires Province, Argentina, in strengthening its Remote Sensing Centre and capacity for agricultural applications of remote sensing.

62. FAO will continue to promote cooperation between Latin American countries in agricultural and environmental applications of remote sensing and GIS through active participation in Space Conferences of the Americas and provision of advisory services. FAO will also assist in preparing a project proposal for the establishment of a regional remote sensing institutional network for Latin American countries.

63. FAO will assist with the preparation of a project proposal for the establishment of a subregional remote sensing institutional network for Caribbean countries.

64. FAO will continue its assistance to countries in the Caribbean subregion in establishing land information systems based on aerial photography, satellite remote sensing and orthophoto mapping. At present such assistance is being provided to Barbados, Belize, and Trinidad and Tobago.

65. FAO continues to assist the countries of central Europe in increasing their capacities for agricultural and environmental applications of remote sensing and GIS. In particular, FAO will continue to offer advice on the use of remote sensing and GIS in planning and implementing agricultural land reform and in the assessment and monitoring of environmental damage. At present, such assistance is being provided to Albania, Czech Republic, Hungary, Poland and Slovakia.

66. FAO continues to contribute to the development of schemes to control pest diseases. Subsequent to earlier studies relating ARTEMIS normalized difference vegetation index (NDVI) data sets to tsetse fly distribution and land utilization types in Nigeria and Togo, an operational information system to define policies for the African Animal Trypanosomiasis control was set up. Remote sensing technologies contribute significantly to the analysis of the tsetse problems. Both NDVI and Cold Cloud Duration facilitated the discrimination of tsetse distributions, and NDVI data were also useful to depict areas where diseased cattle are concentrated. Tsetse and trypanosomiasis maps considered in conjunction with data layers on land use showed that man and livestock avoid areas most heavily infested by tsetse flies. Remote sensing is used to define technical concepts for tsetse control in countries where high resolution satellite images are available to discern land utilization types.

67. In the field of agricultural statistics, with the support of FAO, about 10 developing countries now try to use the techniques of satellite imagery, which can be used for geographical stratification (subdivision in homogenous land units), area sampling frame, regression estimate and area sampling survey.

Study, pilot projects and operational applications

68. The Office for Outer Space Affairs and FAO have initiated discussions with the United Nations International Drug Control Programme (UNDCP) to define possibilities for cooperation on the use of remote sensing technology by the latter. The subjects of the discussions include the organization of a meeting of experts in remote sensing and associated technologies in the period 1995-1996 to address the use of satellite data for detecting and monitoring narcotic crops, monitoring alternative development projects and crop

substitution activities, and determining environmental damage due to narcotic planting, processing and distribution. Projects are conducted by FAO in Afghanistan, Colombia and Lebanon. A desk study is also ongoing for an expert consultation (see para. 112, below).

69. The Department of Humanitarian Affairs of the United Nations (DHA) continues to promote and direct activities of the International Decade for Natural Disaster Reduction (IDNDR) (1990-1999) (General Assembly resolution 44/236 of 22 December 1989) through the IDNDR secretariat. As a part of the IDNDR activities, special attention has been directed towards the use of remote sensing and space technology for monitoring and reducing the impact of natural disasters. Several of IDNDR projects developed by the specialized agencies as well as by Governments are aimed at improving the use of satellite monitoring and communication systems so as to widen their actual geographic coverage and to enhance the dissemination of effective warnings in case of disaster.

70. As a part of the above activities, the World Conference on Natural Disaster Reduction, organized by the IDNDR secretariat, was held at Yokohama, Japan, from 23 to 27 May 1994. The Conference adopted the Yokohama Strategy and Plan of Action for a Safer World, which stated that the availability and effective use of new technologies and their applications in natural disaster reduction, with particular emphasis on warnings, should be enlarged and improved, and it requested the United Nations, through the IDNDR secretariat, to provide Governments, upon request, with technical assistance in the preparation and development of disaster management plans and programmes.

71. Environmental monitoring at the global, regional, national and local levels requires new and innovative approaches for the analysis of multi-source, multi-scale and multi-temporal spatial datasets. There is a constant, pressing need for establishing a base of scientifically proven analysis techniques to support environmental sensing using remotely sensed data. UNEP through GRID-Sioux Falls will continue its cooperation with scientists of the Earth Resources Observation Systems Data Center in the development of algorithms and techniques for change detection using remotely sensed data in support of operational programme needs. A working bibliography on change detection using remotely sensed data is being compiled.

72. UNEP, in cooperation with FAO, through its GRID-Geneva facility will continue its work aimed at merging existing forest/non-forest 1 km advanced very high resolution radiometer (AVHRR) datasets into a global coverage.

73. UNEP will continue its collaboration with the Geological Survey, National Aeronautics and Space Administration (NASA), Environmental Protection Agency and Forest Service of the United States of America, JRC-Ispra and International Geosphere-Biosphere Programme of the International Council of Scientific Unions (ICSU) through GRID-Sioux Falls in the development of a global land-cover characteristics database using AVHRR 1-km data from the United States National Oceanic and Atmospheric Administration (NOAA) polar-orbiting satellites. This will also include ancillary information such as elevation, eco-regions, climate and soils data. The task involves AVHRR time series data assembly, ancillary data collection, imagery analysis and interpretation, validation and evaluation, and generation of output products. The plan is to complete a global land-cover characteristics database by 1997. The first global product derived using AVHRR 1-km data as a result of this collaboration was displayed during the seventeenth Governing Council of UNEP, from 10 to 21 May 1993.

74. UNEP GRID-Bangkok and GRID-São José dos Campos facilities will continue to contribute to this effort. The UNEP contribution will also include, depending on the availability of funds, establishment of regional expert panels to develop suitable classifications systems and to evaluate the accuracy and utility of national, continental and global data sets being developed under land-cover characterization studies. There will be possibilities for experts from developing countries to participate in the database development by

working at GRID-Sioux Falls for periods ranging from six months to one year. The development of an appropriate statistical sampling strategy for validation of results will be also continued.

75. UNEP through its GRID-Bangkok facility will continue to develop further the forest/non-forest classification of the region covered from longitudes 81 East to 120 East and from latitudes 20 North to 10 South. This activity is designed to provide regional support to FAO and the European Community Tropical Ecosystem Environment Observations by Satellite (TREES) project and will contribute to UNEP efforts in the development of a global forest/non-forest database. LANDSAT Thematic Mapper (TM) images of selected areas are being used to verify the AVHRR derived classification. This activity is expected to continue in 1995. Land-cover mapping using AVHRR data was finalized in 1994 for Cambodia, Lao People's Democratic Republic and Nepal.

76. UNEP has carried out a review of applications of NOAA-AVHRR 1-km data for environmental monitoring through its GRID-Sioux Falls centre. Through this centre, UNEP is also contributing towards the development of algorithms and techniques for the automatic identification and extraction of various phenologically indicative parameters from time series 1 km AVHRR Normalized Difference Vegetation Index composites.

77. The UNEP Regional Office of Europe, with GRIDs-Geneva and Warsaw, continues the forest damage assessment project for the central and eastern European countries, known as the "Large-Area Operational Experiment for Forest Damage Monitoring in Europe Using Satellite Remote Sensing". The project makes extensive use of LANDSAT TM images for the detection of large-scale forest damage.

78. UNEP through its Desertification Control Programme (DA/PAC), in association with the Institut géographique national France international, undertook a five-year project (1987-1992) in West Africa for developing a methodology to assess ecological changes and, eventually, dry-land degradation in the South Saharan arid, semi-arid and sub-humid zones. This included analysis and comparison of aerial photographs and SPOT (France) and NOAA satellite imagery over transect covering areas of Burkina Faso, Mali, Mauritania and Niger.

79. Through the above programme, UNEP will continue to implement the following projects during 1994-1995 using remotely sensed data: (a) national land degradation assessment and mapping in Kenya (in collaboration with the Governments of Kenya and the Netherlands); and (b) qualitative and quantitative assessment and mapping of desertification in two countries in the ESCAP region (in collaboration with national Governments and ESCAP).

80. UNEP and UNESCO will continue cooperation with the Scientific Committee on Problems of the Environment of the International Council of Scientific Unions (ICSU) in 1995.

81. UNEP efforts, through GRID-Arendal in Norway, will continue to develop and refine a GIS database of the Baltic Sea catchment area during 1994-1995 and beyond.

82. UNEP, through its Environment Assessment Programme (EAP), will continue the Soils and Terrain database (SOTER) activities throughout 1994-1995. A joint Global Environment Monitoring System (GEMS) and FAO activity involves development of a 1:5 million scale SOTER database for Latin America which is implemented by the International Soils Reference and Information Centre (ISRIC).

83. UNEP, through its EAP, including GEMS and GRID, will continue to contribute to the work of the Committee on Earth Observation Satellites (CEOS) as an affiliate.

84. UNEP, through GRID-Tsukuba in Japan, is negotiating a memorandum of understanding with the National Institute of Environmental Studies and the National Space Development Agency of Japan (NASDA), to define the framework for a cooperative project to generate and disseminate environmental information derived from MOS-1/1b data provided by NASDA. Information dissemination will be through the GRID network for peaceful and non-commercial use.

85. UNEP through its GRID-Sioux Falls facility, in cooperation with the United States Geological Survey, will produce a coherent high resolution 30-arc-second global, digital elevation data set. The work on Africa and North America is complete, and it is expected that a local elevation database will be ready by the end of 1995.

86. UNEP, through the GRID-Arendal facility in Norway, will initiate in the period of 1995-1996 the development of an "Environmental atlas for the Barents region". The first activity will be to prepare a wilderness map for the region in cooperation with the Norwegian Directorate for Nature Management.

87. UNEP will, through GRID-Arendal, carry out in 1995-1996 a pilot phase for the establishment of a comprehensive Arctic Environmental Data Base for Europe and Asia, in close cooperation with a number of Norwegian, Russian and international institutions and in harmony with the bilateral environmental cooperation between the two countries.

88. UNEP cooperation with the World Conservation Monitoring Centre will continue in 1994 and beyond.

89. The UNEP GRID-Geneva facility, in conjunction with the European Union's Joint Research Centre (JRC) at Ispra, Italy, completed a satellite-data-based analysis of West African tropical forest cover in April 1994. NOAA-AVHRR-local area coverage (LAC) satellite images and LANDSAT TM data were combined to estimate the remaining extent of tropical forest cover in the region. The data were combined with information from field research, large- and medium-scale maps and ancillary data to estimate forest cover change in West Africa between 1987 and 1992, updating a previous study carried out at GRID-Geneva. The results of the recent study were provided to FAO through JRC-Ispra, as part of the 1990 Forest Resources Assessment.

90. The UNEP GRID-Geneva facility, in consultation with the European Forest Institute at Joensuu, Finland, and the EU JRC at Ispra, Italy, is carrying out a Europe-wide survey of forestry maps and digital data, including those obtained by space-based means. One result of the survey will be a database compiling European forest-related data at GRID-Geneva which will be available to the public free of charge.

91. ECA will undertake in 1995-1996 the following studies, where remote sensing and GIS are important components of the terms of reference:

(a) Problems related to sustainable development and utilization of natural resources and energy: strategies for intercountry cooperation in the context of Agenda 21;

(b) Technical study on land information systems with special attention to forest planning and management within the perspective of sustainable development;

(c) Up-dating of the ECA study on the status of resource mapping programmes in Africa; among other aspects, the efforts and plans to incorporate satellite data sources and GIS as standard procedures in national programmes will be highlighted;

(d) A roster of African specialists in the field of geo-information compiled at the request of contributing member States to ECA sponsored regional remote sensing centres;

(e) Data revision and conversion of the "Digital Cartographic Inventory Atlas" project during the present biennium and beyond.

92. Among the pilot projects that DDSMS and ECA are considering developing jointly during 1994 and 1995 and future years, priority has been given to the area of river basin planning and management. Accordingly, ECA has submitted a project profile on resource and land information systems for integrated river basin development.

93. ECA will cooperate with FAO in planning, coordinating and executing activities of the AfRICOVER project (see also para. 119 below).

94. RECTAS (ECA) will undertake the following studies in 1995-1996:

(a) Remote sensing inputs for the study of population, development and environmental impact of the "West Africa Long-Term Prospects Study" of the African Development Bank;

(b) Assistance in the processing and interpretation of LANDSAT mobile-satellite services in impact study of vegetation and forestry with data provided by the European Space Agency (ESA) for the Forest Research Institute of Nigeria.

95. RCSSMRS (ECA) has signed an agreement with the TELEOS company for the establishment of a portable ground receiving station at RCSSMRS by the first quarter of 1995. The portable station will enable the RCSSMRS to receive for the region real-time satellite data including those of LANDSAT, SPOT, ERS-1 and other LANDSAT-series and radar satellites. Plans are under way to develop various value added products in cooperation with Earth Observation Satellite Co. (EOSAT; United States of America) and Telespazio (Italy).

96. RCSSMRS (ECA) will continue with the Radarsat research project started in September 1993, which will end in September 1996. The project is to prepare the user community to be ready to utilize radar data for the survey on natural and environmental resources made available from the Radarsat to be launched by Canada in 1995.

97. RCSSMRS (ECA) will participate in the AfRICOVER project, which starts at the beginning of 1995. RCSSMRS will implement the training activities as well as house the East Africa regional component. RCSSMRS will also be involved in the production of the remote sensing products required for the project.

98. RCSSMRS (ECA) plans to strengthen reception and creation of databases for environmental monitoring. RCSSMRS, in cooperation with FAO and France, plans to restart and revamp the Remote Sensing Component for Early Warning Systems for Food Security in the Region to make it operational during the years 1995 and 1996. During the last quarter of 1995 and the year 1996 and beyond, RCSSMRS, in cooperation with EC, will continue the operation of the early warning systems for food security in the Eastern and Southern Africa region.

99. ECE is developing the concept of its Basic Elements Automated Monitoring Satellite (BEAMSAT), which would be a multifunctional remote sensing satellite to monitor air pollution, water resources, damage to forests and conditions of the soil, and of flora and fauna on a global scale. BEAMSAT would make it possible to constantly and promptly obtain more accurate data on various matters in the above fields. ECE is planning to conduct in the period 1995-1996 the feasibility study on BEAMSAT through which, among other things, types of sensor to be deployed, methods for data processing, cross correlation of data, definition of user requirements, structure of implementation, legal and regulatory aspects, and coordination with other organizations would be examined.

100. The ESCAP Regional Remote Sensing Programme (RRSP) will arrange six pilot projects to customize GIS/remote sensing for operational use in integrated natural resources and environment management and in development planning. Two of the pilot projects will be initiated in 1994 and continue till 1995. Another set of two will be started in 1995 and continue till 1996. A third set of two pilot projects will be initiated in 1996 and will end in 1997.

101. FAO and ESA will continue their cooperation in developing appropriate techniques for the applications of satellite synthetic aperture radar (SAR) imagery to agriculture and forestry in developing countries. Similar cooperation has started with Canada Centre for Remote Sensing.

102. FAO is continuing cooperation with the Government of France in developing operational methodologies for applications of high-resolution remote sensing data in international development projects through implementation of pilot studies. Their results are published in a new FAO Remote Sensing Centre series of technical publications and brochures for decision makers. In addition, the Government of France is preparing a new phase of its support to FAO in the field of standardization and harmonization of methodologies of the use of remote sensing and GIS techniques.

103. FAO has cooperated with the Dutch National Aerospace Laboratory (NLR) and the Agricultural University of Wageningen on the implementation of a feasibility study on "A global operational forest cover monitoring network based on satellite remote sensing". It will be followed by other feasibility studies as required by the FAO Global Forestry Resources Assessment 1990 (FRA 90) project.

104. The FAO FRA 90 project is based upon the use of representative samples, collected on different dates, of high-resolution optical and microwave remote sensing image data for the assessment and monitoring of tropical forest cover and land use. Change matrices will be derived which describe in more detail than heretofore possible the changes over time in the variables observed at the global, regional and subregional levels, which should lead to a better understanding of the processes of deforestation and forest degradation.

105. Under the FRA 90 project, the completion of the multi-temporal analysis (1980-1990) of about 120 samples of the size of a LANDSAT scene is expected by mid-1994. It is proposed to continue the analysis of multi-temporal satellite data with a sampling rate of 10 per cent per year, equivalent to about 120 LANDSAT frames, in order to achieve a wall-to-wall coverage of the tropical belt every 10 years. Close cooperation between FRA, UNEP and the TREES project of JRC-Ispra, has been agreed upon.

106. In particular, with the Government of the Netherlands, FAO is preparing a new cooperative programme, "Pilot remote sensing processing and archiving system for forest assessment and monitoring", called RESPAS. The project will produce geometrically corrected remote sensing data, optimized for forest applications, to national and subnational forest departments and to the National Tropical Forests Action Programme units to establish and/or strengthen the capacity of developing countries to assess and monitor their forest resources. It could be further developed to be integrated with GIS and other data bases, such as the Forest Resources Information System and with simulation and modelling capabilities to assist in the planning and definition of forestry policies. The Tropical Forest Action Plan Coordination Unit (FRA) and the Field Programme of FAO would be the main users. This project has already started with a user needs assessment in order to reach user requirements at a national level for managing forest areas and a preliminary outline for the RESPAS system concept. Pilot countries that should be involved are Colombia, Guinea, Kenya and the Philippines.

107. FAO will also continue its study on the use of time series of ARTEMIS vegetation assessments to improve estimates of the length of the growing period and its variations, particularly in the Sahel region.

108. FAO will continue its cooperation with the FAO divisions responsible for sustainable management of agricultural, forestry and fisheries natural resources and for the FAO Global Information and Early Warning System on Food and Agriculture (GIEWS) on increasing the use of remote sensing inputs and their integration with other inputs in GIS.

109. FAO will continue to assess existing forest resources and trends in deforestation, forest degradation and plantations. A number of pilot studies will be undertaken to test new data and to develop appropriate methodologies. An operational workplan is in preparation by JRC (EU), Ispra, and FAO in order to integrate the use of NOAA-AVHRR defined by the TREES project and the methodology used by FRA (FAO).

110. In the framework of FAO inputs to the ongoing and planned global environmental programmes such as the GTOS, FAO will continue its cooperation with organizations within the United Nations system, specialized agencies and other international organizations in providing remote sensing expertise and in participating in pilot studies in areas within its mandate.

111. FAO contributes to the preparation of four Sahara and Sahel Observatory projects:

(a) Assessment and monitoring of land degradation and desertification in North African countries, with the Centre régional de télédétection des états de l'Afrique du Nord (CRTEAN);

(b) Harmonization of the uses of NOAA-AVHRR and Meteosat data for environmental monitoring;

(c) Preparation of the Africa GIS 1995 Conference at Abidjan, in March 1995, with UNITAR;

(d) Setting up of a long-term ecological monitoring observatories network (ROSELT), in Africa, in the framework of GTOS activities.

112. FAO is continuing to cooperate with UNDCP on pilot projects to determine narcotic drug plantations from satellite remote sensing data. This cooperation has yielded very promising results and is being expanded. Planned studies will use high-resolution data from new optical and microwave Earth observation satellite systems. Increased use of GIS and expert systems for modelling and forecasting is also planned.

113. FAO, with funding support from the Government of the Netherlands, continues to provide operational remote sensing inputs into the GIEWS (FAO) and the Desert Locust Prevention Programme through the upgraded ARTEMIS. Research work will continue on the integration of meteorological rainfall estimates based on remote sensing and on improvement of data on the length of growing periods.

114. The Government of the Netherlands approved in August 1993 phase III of the ARTEMIS project (1993-1996), which will enable complete integration of the ARTEMIS core costs into the FAO Regular Programme and provide support for operational environmental monitoring activities and technology transfer and training programmes at regional and national levels in Eastern and Southern Africa. In October 1993, the Government of the Netherlands approved a three-year phase II regional remote sensing project for the SADC countries. The objective is to make the SADC region self-supporting for the acquisition, preprocessing and thematic processing of Meteosat and NOAA-AVHRR data for providing operational information services for early warning for food security and environmental monitoring.

115. A technical capability for processing and distribution of ARTEMIS data for West and Central Africa is currently being developed within the FAO Regional Office for Africa at Accra, Ghana, and cooperation is being established with various institutions in Ghana and Côte d'Ivoire for supporting applications development and calibration activities.

116. The ARTEMIS vegetation index products will be extended to cover the whole of Asia and Latin America in addition to their current coverage of Africa and South-East Asia. FAO has developed a 10-year archive of ARTEMIS vegetation data . A new programme named RAMSES will start at the end of 1994, for three years, with the support of the Government of Belgium, in order to improve the use of NOAA-AVHRR data for the early detection of locust areas in Africa, in the framework of the new EMPRES (FAO) programme.

117. GIEWS (FAO) has the unique responsibility of providing early warning of food security emergencies for the whole world. Remote sensing and agrometeorological data and information are used as one of the inputs in the evaluation and assessment process. The development of models to integrate satellite and agrometeorological data with socio-economic and nutritional information, using GIS technology, is currently being finalized under the GIEWS Risk Mapping Project. This Project is implemented by FAO in partnership with the Save the Children Fund in London and executed by GIEWS with financial assistance from EU.

118. FAO, as a spin-off of the ARTEMIS development, in cooperation with the Government of the Netherlands, prepared a project proposal which is being considered by the Government of the Netherlands for funding in 1994, for the design of RESPAS. This dedicated image processing and GIS system will be optimized for the assessment and monitoring of forest cover based on high-resolution remote sensing optical and microwave image data.

119. FAO, in cooperation with ECA, is continuing preparatory activities for a national/regional project called AfRICOVER, which aims at strengthening the capacities of African countries for the sustainable management of natural resources, food security and environmental protection and for practical applications of advanced geographic information technologies, while establishing a land cover digital database and producing a land cover map at different scales. The project which involves other interested United Nations bodies, such as the World Bank in the framework of the national environment action plans, is to be implemented in African regional and national remote sensing centres and mapping agencies. FAO has set up a TCP for a preparatory phase, and the first step has been made in a technical consultation and a first donor meeting at Addis Ababa, held with and at ECA headquarters, in July 1994. A new project document, taking into account the findings of the above meeting, will be sent to African countries and potential donors. The East African component of AfRICOVER will start at the end of 1994 for three years, with financial support from Italy of US$ 5.5 million.

120. It is expected that other donors could support the various components of this continental project. France and the World Bank have already decided to analyse their potential contribution by the end of 1994.

121. FAO and ESCAP are preparing the OLIVIA Programme for the development and implementation of a comprehensive operational satellite environmental monitoring system for Asia and the Pacific, in support of sustainable development. UNEP and the Asian Institute of Technology (AIT) at Bangkok were involved during the preparatory phase of this Programme. The initial three-year phase foresees the formulation and implementation of a number of focused and interrelated pilot projects. A multi-donor support will be solicited. China is interested in being one of the key countries for the development of the OLIVIA Programme.

122. FAO, through its Remote Sensing and Agrometeorology Centre (AGRT), continues its efforts to optimize the use of remote sensing and agrometeorological technologies in itself and to effectively transfer and integrate their use into its member States activities for the specific purposes of enhancing the timeliness, cost effectiveness of data collection; inventory, monitoring and management of resources at various levels; and early warning and environmental monitoring.

123. In January 1995, AGRT (FAO) will include GIS activities and become the FAO Remote Sensing, Agrometeorology and GIS Centre, under the direct administration of the Head of the new Department of Sustainable Development.

124. In 1995 and 1996 and beyond, FAO envisages the use of GPS in surveys and the integration of remote sensing data into GIS-based land resources information systems in order to broaden the range of applications. Further, FAO considers using remote sensing to assess and monitor the progress of soil and water conservation works carried out in the field within the framework of WFP-assessed national programmes. An Interdepartmental Working Group was established on land use and land-cover planning, working with UNEP and UNESCO.

125. The Investment Centre (DDC) of FAO uses remote sensing data to supplement or update geographic information needed for the preparation of projects. In addition, it is increasingly incorporating remote sensing components in projects concerned with the development and management of natural resources. Guidelines for the use of remote sensing in the design of investment projects are now ready for publication.

126. Within FAO, a Land Regularization Task Force has been set up by several divisions. This interdisciplinary group coordinates activities regarding Land Information Systems. The Systems depend upon remotely sensed data, primarily aerial photographs and orthophoto maps, in constructing effective multipurpose cadastral and land records systems for land registration and administration.

127. The IOC (UNESCO) Global Ocean Observing System (GOOS) will continue to contribute to the work of CEOS in the development of user requirements for sensors and data management systems.

128. UNESCO and ITC will complete the implementation of the ongoing cooperative programme Geoinformation for environmentally sound management of natural resources, in 1995, which involves activities concerning the application of GIS and remote sensing and training in the fields of ecology, hydrology and geology.

129. Within the framework of the Man and the Biosphere (MAB; UNESCO) programme and in cooperation with UNEP, the National Institute for Research in the Amazon (INPA-Brazil) and the Institut français de recherche scientifique pour le développement et coopération (ORSTOM-France), UNESCO is developing a multidisciplinary research programme on the economic and ecological sustainability of tropical forest management in the Central Amazonia region. Remote sensing technologies will be used for natural resource surveying and mapping.

130. UNESCO will establish a remote sensing centre at the Libyan Secretariat for Scientific Research, within the framework of a research project aimed at studying the natural resource potential in the south of the Libyan Arab Jamahiriya. FAO will cooperate in establishing the centre relating to agricultural applications.

131. UNESCO, in cooperation with the Center for Remote Sensing of Boston University, United States of America, will assist in 1995 and 1996 the Omani authorities in establishing a geographical information system and a digital image-processing laboratory.

132. UNESCO, in cooperation with the International Union of Geological Sciences (IUGS) and the Royal Museum of Central Africa (Belgium), will continue to implement the third phase of the Geological Applications of Remote Sensing (GARS) project in Africa, which aims to develop a remote sensing user network involving Burundi, Rwanda, Uganda, the United Republic of Tanzania and Zambia. UNESCO and IUGS will continue to implement the second phase of the GARS-Latin America project which focuses on the study of the mitigation of natural hazards in the Andean region through the use of microwave space-borne

sensor data, and will launch, in the period 1994-1995, the new GARS-Asia project, which concerns the monitoring of pre-active volcanoes with the use of remote sensing technology.

133. UNESCO, in collaboration with international institutes such as ITC, will continue to carry out experimental monitoring of selected cultural sites inscribed on the World Heritage List, using remote sensing methods and GIS. The historic sites of Angkor in Cambodia and Moenjodaro in Pakistan are among these.

134. During the World Conference on Natural Disaster Reduction (see para. 70 above), WMO organized a Technical Committee on Warning Systems, the objective of which was to provide an opportunity for an exchange of information and views concerning technology application for warning and early warning systems. WMO and UNESCO will jointly publish the presentations made by participants at this Committee.

135. The World Bank pursues its remote sensing and GIS activities by incorporating remote sensing and GIS technology as small sub-components of larger World Bank funded projects and by conducting an in-house programme of research into the strengths and limitations of the technology.

136. The World Bank, which has traditionally applied remote sensing and GIS technology to project-specific activities and to selected national survey and mapping problems, now studies through the Global Environmental Facility some of the regional and global problems which are becoming of greater importance in the era of global environmental awareness, e.g. international waters, ozone layer and global warming.

137. The World Bank, under its African Environmentally Sustainable Development Division, an important initiative of which focuses on the need for improving the access of African nations to and the quality of data on the nature and extent of their natural resources, will continue to assess selected regional and national survey, mapping and inventory capabilities in Africa with a view to providing direct operational support.

138. The World Bank actively pursues cooperative natural resource and environmental database development programmes with many international agencies and non-governmental organizations. In particular, the World Bank has developed joint programmes with UNDP, UNEP, FAO, International Geographical Union, World Resources Institution and Swedish International Development Agency and is considering closer working relations with the UNEP GRID programme.

3. Dissemination or exchange of information on the status of technology or operational systems through meetings or publications

Dissemination of technological information

139. Since 1989, the United Nations Programme on Space Applications has published an annual collection of papers selected from among those presented at the meetings, workshops and training courses organized under its auspices. The publication, entitled Seminars of the United Nations Programme on Space Applications: Selected Papers on Remote Sensing, Satellite Communications and Space Science, covers different aspects of space science and technology. It includes papers that are broad in scope and of enduring interest. The 1995 edition, which will be the sixth edition, will contain manuscripts concerning remote sensing from the activities of the Programme conducted in 1994 at the following locations: ESA/ESRIN; Stockholm University and the SSC Satellitbild at Kiruna, Sweden; Beijing, China; and Lima, Peru.

140. The Office for Outer Space Affairs will prepare a study on the "Use of remote sensing technologies for environmental applications, particularly in support of the recommendations of the United Nations Conference on Environment and Development".

141. UNEP GRID, through its Sioux Falls Centre, has developed a manual on "Environmental GIS and Image Processing (IP): With Special Reference to Developing Countries". It is expected that such a publication will provide understanding of basic principles of GIS and IP, increase familiarity with the available tools and impart practical tips for project design using GIS and IP. The manual will be produced in cooperation with Clark University, United States of America, and the United States Agency for International Development (USAID).

142. UNEP through GRID-Sioux Falls will update its comprehensive analysis of data policies of current and planned satellite systems in 1995-1996. The aim is to bring up to date market intelligence on the subject to United Nations agencies and developing countries and to help them in formulating suitable strategies for the purchase of commercial products from the different satellite systems.

143. UNEP will publish the proceedings of the international workshop on "Developing large environmental databases for sustainable development", which was hosted by UNEP GRID, from 14 to 16 July 1993, at Nairobi. The workshop was sponsored by the International Union of Forestry Research Organisations (IUFRO) in cooperation with FAO. Some 90 participants from 21 countries attended the meeting, including representatives of key international organizations working with environmental databases.

144. UNEP through its various GRID centres will move towards on-line data distribution services through the Internet in 1994 and 1995. Links and pointers to other meta-data systems are also under development.

145. UNEP through GRID-Sioux Falls is cooperating with the United States National Biological Survey to provide on-line access to information and data on gap analysis in biodiversity using the Internet tool, Mosaic.

146. The work of UNEP on genetic resource databases and networks will continue in 1995 and beyond.

147. UNEP will, through the Norwegian GRID-Arendal facility, continue its support to the Arctic Environment Protection Strategy (the Rovanijemi) by further developing the Project Directory for the Arctic Monitoring and Assessment Program (AMAP) and the database on protected areas in the Arctic for the Conservation of Arctic Flora and Fauna programme.

148. UNEP, through the GRID-Arendal facility, will host the secretariat of the International Arctic Environment Data Directory (ADD) and, in cooperation with major institutions holding environmental information on the Arctic environment, initiate the further development of ADD.

149. UNEP will, through the Norwegian GRID-Arendal facility, prepare a PC-based State of the Environment report for Norway. All data are made available for the UNEP EAP and other interested users through the GRID database.

150. UNEP, through its EAP, will publish in 1994 and beyond reports on examples of GIS and remote sensing techniques applied to projects supported by GRID for solving environmental problems. These reports, previously issued in the GRID Information Series and Case Study Series will in the future be published in the Environment Assessment Technical Reports series. From September 1994, the information regarding data management, which was previously published in "GRID News" will be contained in the newsletter of the EAP, "Earth Views".

151. The UNEP GRID programme provides ready access to several thousand environmental datasets of which approximately 40 per cent are derived from satellite sensors. The GRID Meta-Database system, to be implemented in 1994-1995, will provide pointers to other sources such as the NASA Master Directory.

152. ECA will organize in 1996 the Ninth United Nations Regional Cartographic Conference for Africa. Tunisia has offered to host the event, and Morocco has offered to be the alternative host country.

153. ECA will continue to publish its cartographic and remote sensing bulletin, of which three issues have been published.

154. RCSSMRS will, within its user services activities, issue in 1995-1996 brochures and newsletters to provide information on the availability of the satellite data in the region for use in various projects.

155. ESCAP will organize the following meetings:

(a) The Annual Meeting of the Directors of the National Remote Sensing Centres/Programmes of the ESCAP region to be held at Dhaka, Bangladesh, in June 1995 with host facilities provided by Bangladesh;

(b) The eleventh session of the Intergovernmental Consultative Committee (ICC) on RRSP to be held also in June 1995 at Dhaka, Bangladesh, which is the current Chair of ICC;

(c) The Annual Directors Meeting in 1996 and the twelfth session of ICC to be held in Malaysia, which has confirmed its offer to host these meetings;

(d) The Annual Directors Meeting and ICC in 1997 to be held in the Philippines; which have offered their host facilities.

156. ESCAP will establish nodal points for 15 national information networks by December 1995 to operationalize the RRSP regional information service (RTS) network.

157. ESCAP will continue to publish the Quarterly Remote Sensing Newsletter in January, April, July and October of 1995 and 1996. Similarly, the biannual Asian-Pacific Remote Sensing Journal in January and July 1995 and 1996 will be published. Both of these recurrent publications are now published under the ESCAP regular budget publication programme.

158. The following non-recurrent publications will also be prepared, published and disseminated as part of the ESCAP regional information service activities:

(a) Country compendiums, to be distributed by December 1995 on institutions and agencies within and outside ESCAP member countries which are using and dealing with natural resources and environment management in order to establish an information exchange network;

(b) Series of programmes reports, to be disseminated by October 1995, on problems and solutions in the applications of GIS/remote sensing to integrated natural resources and environmental management;

(c) Reports of the pilot projects conducted under the regional GIS/remote sensing programme, to be disseminated to the participating countries by mid-1995;

(d) Proceedings of seminars, meetings and workshops organized by ESCAP during the 1995-1996 period.

159. The series of technical publications and brochures for decision makers have always been among the main priorities of FAO. A number of publications and brochures were issued in 1993 (A/AC.105/551, para. 129). During 1994, the "decision makers series" which were published in cooperation with the Centre national de télédétection de Tunisie include Des images satellites pour l'étude de la pollution marine, No. 7;

Des images satellites pour l'étude dynamique de la désertification, No. 8; Evaluation des dégâts causés par une catastrophe naturelle, No. 9; Des images satellites pour les aménagements ruraux, No. 10; and Des images satellites pour l'étude de l'expansion urbaine, No. 11.

160. UNESCO, within the framework of the MAB programme, will synthesize and publish its recent GIS case studies for biosphere reserve management in developing countries. A task force for biosphere reserve data management will soon be established. This task force will elaborate strategies, tactics and technical protocols for improving biosphere reserve data management, including the use of GIS and remote sensing, and will plan future activities.

Elaboration of strategies or plans for future applications programmes or systems

161. ECA also envisages including for 1996-1997 one expert group meeting as a follow-up of its first ad-hoc expert group meeting held in 1994 on policies and strategies for the development of natural resources and energy in Africa. This expert group meeting will re-examine the status of the African remote sensing programme with special attention to the constraints and obstacles that countries in the region may continue to confront in sharing the benefits of remote sensing and GIS.

162. The following activities on regional networks of RRSP (ESCAP) will be organized by ESCAP/RRSP with major funding from UNDP and co-financing and cost-sharing by member countries and other donor agencies:

(a) Expert group meetings on the formulation of the Action Programme for Regional Space Applications for Sustainable Development in January 1995;

(b) Consultative Group Meeting on Implementation of the Regional Action Programme for Space Applications for Development in September 1995;

(c) Expert Working Group to prepare guidelines for GIS standardization in March 1995.

4. Establishment of centres for space science and technology education

163. In response to General Assembly resolution 45/72 of 11 December 1990, in which the General Assembly endorsed the establishment of regional centres for space science and technology education in developing countries, the United Nations Programme on Space Applications continues to make progress in establishing such centres for space science and technology education in developing countries, which are expected to enhance the academic and professional capabilities and technical infrastructure in space science and technology in each region.

164. Following the evaluation missions to the ESCAP, ECLAC, ECA, and ESCWA regions, discussions are under way on the establishment of centres in those regions between the Governments of the countries concerned and the United Nations. In the region of ECLAC, Brazil and Mexico, which have been selected by the United Nations to host the Centre for Space Science and Technology Education for the Latin American and Caribbean Region, have recently concluded negotiations with a view to its establishment. The secretariat of the Centre would rotate every four years and would initially be located at the National Institute for Space Research (INPE) of Brazil and have a Secretary-General of Mexican nationality. For the ESCAP region, the Office for Outer Space Affairs presented its recommendations and proposals for the establishment of the regional centre at the Ministerial Conference on Space Applications for Development in the ESCAP region to be held at Beijing, China, in September 1994.

165. ECA will continue to support the Office for Outer Space Affairs of the United Nations as a necessary step for the creation of endogenous technical capacity and as a complement to the training normally offered by regional centres.

166. FAO supports and plans to cooperate with the proposed regional centres for space science and technology education within its mandated areas. The centres will significantly contribute to strengthening educational opportunities in the peaceful uses of outer space in developing countries. FAO will be particularly interested in the programmes of existing centres related to applications of remote sensing and GIS to inventories of renewable natural resources, natural disasters control and early warning systems, avoiding duplication in the framework of Agenda 21 and its different chapters.

5. Capacity building

167. The 1994-1995 activities of EAP (UNEP) focus on human resource development, technology and strengthened institutional capacities with a view to operating management information systems with dedicated spatial data system linkages to support national and international environmental assessments. The two principal objectives are (a) to ensure that participating subregional organizational networks and their component national focal point agencies have the necessary capability and capacity to manage geographic and demographic data; and (b) to maintain these activities in a close working partnership with UNEP and the United Nations system-wide Earthwatch agencies so that the data and information held in their database can be harmonized with, and augmented by, data from the international agencies.

168. EAP (UNEP) strives to complement the efforts of established organizations, and partnerships and efforts towards collaboration have commenced and are being formalized. The programme is active in Africa, and Asia and the Pacific, and has commenced preparatory activities in newly independent States in central and eastern Europe, and Latin America and the Caribbean. The programme is conducted in close cooperation with UNDP, United Nations Sudano-Sahelian Office (UNSO), UNITAR and is developing closer ties with the regional information management activities of FAO and WMO.

169. In Africa, UNEP executes the following activities under its EAP-Environment and Natural Resource Information Networks (ENRIN):

(a) In partnership with SADC/Environment and Land Management Sector (ELMS), UNEP has continued to move towards establishing a subregional environmental and natural resources information network for the ELMS Unit and the 10 SADC member States. UNEP, SADC and GTZ jointly supported and commissioned an expert consultancy to assess the information management needs of the SADC network. The findings of the mission were presented to a formal meeting called by SADC/ELMS in September 1994. The meeting will recommend the form of the final project proposal for submission to donors for financing (A/AC.105/551, para. 31);

(b) Together with UNSO and UNITAR, UNEP has discussed cooperation with IGADD to participate in an information management and network needs inventory for IGADD and its member States. The preliminary agreement to support the development of national needs inventories and to assist national consultants has been reached. It is expected that the IGADD activity will commence during the latter half of 1994 and continue in 1995 and in the following years;

(c) UNEP continues to provide backstopping assistance and services to maintain environment and natural resource information system capabilities established in Botswana, Burkina Faso, Côe d'Ivoire, Ghana, Lesotho, Mozambique, Niger, Uganda, United Republic of Tanzania and Zambia, during the UNEP GEMS/UNITAR project;

(d) With CILSS/AGHRYMET, UNSO and UNITAR, UNEP are attempting to re-establish a subregional technical support programme. Funding support has to date not been secured (A/AC.105/551, para. 30);

(e) UNEP continues to provide technical advice to Uganda, United Republic of Tanzania and Zambia, which are developing national environment information networks of key institutions active in managing environmental and natural resources. Technical and advisory support is provided by UNEP to: (i) the National Environment Information Centre of Uganda to conduct a detailed assessment of the level of the Environment Information System development in the country and the impact on decision makers; (ii) the National Environment Management Council of the United Republic of Tanzania, in cooperation with UNSO, to develop a one-year preparatory assistance proposal funded by UNSO to establish a national environment information network; and (iii) Zambia, in cooperation with the Environmental Council of Zambia, to establish a national environment information network for the country. The preparatory phase is scheduled for completion in June. A five-year programme to strengthen networking in Zambia is scheduled to commence in 1995. Similar proposals to establish such programmes as mentioned above in Botswana and Ghana are being reviewed by national institutions;

(f) UNEP undertakes supporting activities to the UNDP/GEF regional biodiversity project for Kenya, Uganda and the United Republic of Tanzania, being executed by FAO, for the development and strengthening of the national database capabilities component of the project.

170. In Asia and the Pacific, the activities under EAP-ENRIN (UNEP) include the following:

(a) UNEP complements the data and information management efforts of established institutions. Memoranda of understanding and agreements to cooperate have been reached with the following five subregional organizations in the Asia and the Pacific region: Association of South-East Asian Nations (ASEAN), International Centre for Integrated Mountain Development, the Mekong Secretariat, the South Asia Co-operative Environment Programme and the South Pacific Regional Environment Programme;

(b) UNEP is targeting 16 countries for more direct assistance during the 1994-1995 programme through the following:

(i) Technology transfer training, provision of equipment and establishment of facilities for Afghanistan, Bangladesh, Bhutan, Cambodia, China, Fiji, India, Lao People's Democratic Republic, Maldives, Myanmar, Nepal, Pakistan, Sri Lanka, Thailand, Viet Nam and Western Samoa;

(ii) Establishment of GIS facility at the Asian Institute of Technology, Bangkok, Thailand;

(iii) Establishment of subregional training facilities at the Tribhuvan University, Kathmandu, Nepal and at the University of the South Pacific, Suva, Fiji;

(c) UNEP provides contractual project implementation support to the following projects:

(i) "Digital database for Ho Chi Minh City (1:10,000 and 1:50,000)" by the Centre for Space Physics and Remote Sensing, Ho Chi Minh City, Viet Nam;

(ii) "Digital database for Hanoi City (1:10,000)" by the Institute for Information and Documentation of Geology, Hanoi, Viet Nam;

(iii) "Land resources information database for Anhui Province (1:250,000; funded by UNDP)" by the Institute of Remote Sensing Applications, Chinese Academy of Sciences, China;

(iv) "Inventory of wetlands in Lao People's Democratic Republic" by the International Union for Conservation of Nature and Natural Resources (IUCN) - World Conservation Union, Lao People's Democratic Republic;

(v) Assessment of information technology, used to meet the needs for environmental assessment, to implement the proposals for the capacity building project to be conducted by the National Environment and Protection Agency (NEPA), Beijing, China;

(vi) Twenty-month project expected to commence in August 1994, to be carried out by the Coastal and Marine Environment Management Information System for southern China, Viet Nam and Cambodia with the Asian Development Bank, UNEP OCA/PAC and East Asia Seas Regional Coordinating Unit;

(vii) Information management in the North-West Pacific Action Plan (NOWPAP) - directory of coastal and marine experts and institutions; bibliography on coastal and marine environments in the region; and feasibility report on GIS applications in coastal marine environment for NOWPAP;

(viii) Assessment and monitoring of desertification in Asia to be conducted with UNEP DC/PAC and ESCAP.

(d) UNEP, through its EAS/GRID, provides database development and data management support to the 1995 regional State of the Environment Report being implemented by ESCAP on behalf of the countries of the region. The ENRIN component is assisting the five subregional organizations and 16 component countries with preliminary state-of-the-environment assessments leading up to the ESCAP report. UNEP is developing closer relationships particularly with the new phase of the UNDP/ESCAP RRSP in its new focus on the integration of remote sensing and GIS;

(e) UNEP is seeking the support of other donor programmes to undertake complementary and/or joint activities. Sound relationships have been established with UNDP and the Asian Development Bank in the region. GTZ, DANIDA and the Finnish International Development Agency (FINNIDA) are making significant contributions to environment information capacity development at national levels;

(f) UNEP is undertaking collaborative activities with other agencies including the Environment Unit, Space Technology Applications Unit and the Statistics Division of ESCAP, the Asian Disaster Preparedness Centre, IUCN, International Rice Research Institute and International Crop Research Institute for the Semi-arid Tropics;

(g) UNEP is developing a regional directory, by country, of institutions, expertise and projects of relevance to environmental assessment. The directories for China, ICIMOD/Nepal, Myanmar, SACEP, SPREP and Viet Nam have been completed, while those for Mekong and ICIMOD/Bangladesh are being prepared.

171. In the newly independent States in central and eastern Europe, UNEP, through its EAP/ENRIN and with WHO Europe, through GRID-Arendal, has commenced preparatory activities to assess the current and future capacity building needs for spatial data and information management. The objective is to develop a network among governmental and associated agencies and institutions responsible for the implementation of, or contribution to, national and international environment assessments and reporting.

172. UNEP EAP/ENRIN, in the region of Latin America and the Caribbean, commenced a project to ascertain the regional priorities for environmental assessment. UNEP has associated spatial database needs for Latin America and the Caribbean in preparation for the development of proposals for capacity building projects related to the environment and natural resource information management.

173. The main emphasis of the activities of FAO in the field of agricultural applications has been placed on the systematic enhancement of the national capacities of existing institutes whose mandate lies in remote sensing, natural resources and mapping. The current tendency is to implement projects whose operational capacity has been vital to larger programmes. The following is the list of activities carried out for the above purposes:

(a) Nile Basin: Through the effective development of an operational remote sensing capacity to receive Meteosat satellite imagery for the Blue and White Nile data, Meteosat derived rainfall information is calibrated and fed into forecasting models to provide up to three weeks advance notice of river flow at critical points along the Blue Nile;

(b) Egypt: Egypt has been the focal point for two other important institution building projects assisted by FAO. The first project is located at the Desert Research Centre, which has now the capacity to monitor the delicate ecological balance of Egyptian rangelands. The Centre will also supply data to the Observatoire du Sahara et du Sahel programme. The second project is located at the Soil and Water Research Institute of the Ministry of Agriculture. As a result of the significant strengthening of its remote sensing capacity, the Institute has expanded monitoring of renewable natural resources in Egypt. Remote sensing is also used for operational soils mapping within the Delta, and regular crop acreage estimates are made for the major crops each season. The Institute has also attracted considerable additional resources on a bilateral basis from Canada and France to further enhance its mapping and agricultural statistics reporting capacity;

(c) Côte d'Ivoire: FAO is assisting in the establishment of a Remote Sensing Laboratory at the Institute for Tropical Geography, University of Abidjan;

(d) Afghanistan: A project for land cover inventory at 1:100,000 and 1:250,000 scales, based on satellite remote sensing, is being implemented. It will provide the basis for assessing the change in area cultivated or lost during the 13 years of war. The historical perspective of land-use changes has been provided from existing maps and photographs which have been digitized and will be compared with the current situation;

(e) Argentina: FAO has been assisting the Federal Secretariat of Agriculture as well as the Province of Buenos Aires in developing operational capacities for agricultural applications of remote sensing and GIS;

(f) Brazil: FAO has introduced remote sensing methodology for the estimation of areas of irrigated rice plantations in the Rio Grande do Sul as well as for the assessment of soil erosion in the Parana State;

(g) Ecuador: FAO assisted in the development of remote sensing methodology for early detection, assessment and monitoring of "critical areas" in respect to land-use changes. The availability of real-time remote sensing data from the satellite data receiving station in Cotopaxi further strengthens the impact of this project;

(h) Belize: A project for the development of institutional remote sensing capacity for land-cover mapping at 1:50,000 scale and for map revisions is about to be completed. The project benefited from close cooperation with the National Geographic Institute of Mexico;

(i) Barbados: FAO, in cooperation with the Canadian International Development Agency, has assisted in the development of an Agricultural Land Information System based on colour aerial photography at 1:10,000 scale, photo-interpretation and GIS.

174. In order to improve availability of current information on vegetation cover and land use in Africa, FAO has formulated a project proposal for a Land Cover Map and Digital Database of Africa. This proposal, which was endorsed by the United Nations Ad Hoc Inter-Agency Meeting on Outer Space Activities, is now being submitted to potential donors (see para. 118 above).

175. FAO should retain the capability to play an active role in the capacity building and strengthening of national and regional bodies, especially in developing countries, through:

(a) Training of decision makers and project managers;

(b) Support to national and regional centres (consultancy for equipment, maintenance, organization, training courses for technical staff);

(c) Technology transfer from Headquarters to countries and regions (early warning systems, projects, pilot action studies).

B. Communications and navigation

1. Education and training programmes

Training courses, workshops and seminars

176. The United Nations Programme on Space Applications plans to hold a United Nations Training Course on Communications Technology for Development in 1995.

177. ITU Radiocommunication Bureau (BR) will be organizing regular biennial seminars in the coming years and regional seminars in the intervening years on frequency management and the use of the geostationary-satellite orbit, with a view to providing technical assistance to the participating countries.

178. WMO proposals for satellite-related training events for the biennium 1995 and 1996 include a training course on communication and data management techniques.

Fellowships

179. Through the United Nations Programme on Space Applications, ESA provides fellowship support for candidates from developing countries for in-depth training in the area of communications systems.

2. Expert services and survey missions to identify specific areas of applications relevant to a given country or group of countries and to carry out specific studies on pilot projects or to implement the projects with operational applications of technology

Provision of expert services

180. The United Nations Programme on Space Applications is collaborating with the Government of the Republic of Korea to establish the Asia-Pacific Satellite Communications Conference (APSCC). The idea of establishing APSCC was born at the United Nations/Republic of Korea Workshop on Space

Communications for Development, organized in November 1992. APSCC will be formally launched on 25 October 1994 at Seoul.

181. UNESCO, as a member of the Inter-Agency Consultative Committee on the RASCOM project, is acting in an advisory capacity and is providing assistance to this project.

182. Activities of ITU in the area of satellite communications include the following:

(a) ITU Telecommunication Development Bureau (BDT) will continue to provide, at the request of member administrations of developing countries, experts for participation in satellite Earth station projects and in the planning of regional or domestic satellite communication systems;

(b) Member administrations will continue to be informed regularly through the BR Weekly Circular and the special sections annexed thereto of frequency assignments and orbital positions communicated to the Bureau in space radiocommunication services. BR (ITU) also responds to requests for advice from administrations on specific topics and provides information and documents, mainly in relation to space radiocommunication services.

Study, pilot projects and operational applications

183. The decision taken at the seventeenth session of the UNEP Governing Council in May 1993 to expeditiously examine the implementation of a satellite-based communications system, referred to as MERCURE, has been vigorously pursued by UNEP and ESA during 1994 and is planned for implementation during 1995-1996. ESA member States through European industry have generously offered a total of 16 earth stations to initiate the network on behalf of UNEP. The system has particular advantages to UNEP and FAO for the exchange of large environmental data sets and satellite remote sensing data among national, regional and international partners and for strengthened communications among its regional offices around the world. MERCURE is being implemented with due consideration of the overall United Nations telecommunications strategy.

184. UNEP has been negotiating with ESA and FAO regarding the possibility of UNEP assuming the responsibility to operate the DIANA data communications network between FAO at Rome and the RCSSMRS (ECA) at Nairobi, Kenya, the Department of Meteorology at Harare, Zimbabwe, and the FAO Regional Office for Africa at Accra, Ghana. The system complements operational early warning systems for food security in Eastern and Southern Africa by providing a fast and efficient data distribution capacity for environmental satellite data produced by the ARTEMIS system in FAO at Rome. Negotiations continue to identify a funding source to ensure the continued operation of the system beyond mid-1994. The DIANA system will possibly be upgraded and integrated with the MERCURE network after the latter initiative is implemented.

185. FAO, in cooperation with ESA, in 1992 started testing the DIANA satellite communication system, which has been developed by European industry under ESA management. The system is at present in demonstration use. Although its cost cannot be justified by the FAO remote ensing telecommunications requirements alone, it may develop into a multi-purpose, multi-user satellite telecommunications system in future. Such a development would significantly strengthen communication links between Africa and Europe.

186. As a follow-up to the World Telecommunication Development Conference (WTDC, Buenos Aires, 1994), organized by the ITU, UNESCO will participate in the established study groups and in the implementation of the Buenos Aires plan of action in its field of competence.

187. UNESCO is continuing to examine different ways and means of making wider use of low and geostationary-orbit satellites systems for communication, information, informatics, education, science, culture and environmental protection in the implementation of programmes and projects, such as the following:

(a) Within the framework of the recovery plan of the Pan-African News Agency, a satellite communication network for exchange of information will be established by linking most of the national agencies in Africa. These activities are conducted in close cooperation with United Nations specialized agencies, national/regional space institutions and non-governmental organizations, as well as interested Member States;

(b) In the framework of the International Commission on Education for the 21st Century (Delors Commission), UNESCO will assess, evaluate and study the achieved experience in distance education, as well as the impact of new communication and information technologies, in particular, communication satellite applicable to distance education.

188. Although the involvement of ITU in the RASCOM project formally terminated in December 1993, ITU is following its activities and coordinating with PANAFTEL, since the two systems (satellite and terrestrial) are complementary (A/AC.105/551, paras. 151 and 152). In particular, rural and remote areas will have to be linked to the networks through either of the above systems.

189. WIPO will continue to study various questions related to the use of broadcasting satellites in the field of copyright and neighbouring rights in the context of the Committee of Experts on a Possible Protocol to the Berne Convention, whose work should continue until 1996. Those questions include the encryption of broadcast signals, and the ownership of rights between the country of emission of the signal and the country/countries of reception ("footprint" countries).

3. Dissemination or exchange of information on the status of technology or operational systems through meetings or publications

190. The United Nations Programme on Space Applications will publish selected manuscripts from the activities of the Programme conducted in 1994 by APSCC with the support of the Government of the Republic of Korea and the United Nations (see para. 180 above).

191. The Office for Outer Space Affairs will prepare studies on "Use of low Earth orbit satellites for voice communications", to provide updated information on small satellites, and "Satellite-based radio broadcasting services".

192. UNEP is promoting modern telecommunication methods, including satellite-based telecommunications for electronic messaging and dissemination of environmental information. For example, "UNEPNET", is a network of Bulletin Board Systems (BBS) computers interlinking UNEP Regional Offices and Headquarters at Nairobi. The network will shortly be open for public access. Additionally, International Referral Service for Sources of Environmental Information (INFOTERRA) has published a subscription list for environmental queries on the Internet, and it is planned for UNEP to open a fully fledged Gopher node on the Internet in the near future.

193. The UNEP International Cleaner Production Information Clearinghouse (ICPIC), one activity of the Cleaner Production Programme, continues to provide an on-line computerized information exchange service to promote the concept of cleaner production on a global scale. Other Cleaner Production Programme activities include: training and technical assistance, in which UNEP Industry and Energy assists Governments, industry and academia in the preparation and presentation of workshops and seminars at their request; publications, which help the dissemination of information and exchange of experience; and

organization of working groups, which collect and disseminate information and provide an input to the direction of the Programme.

194. ITU will continue to contribute in this sphere through the following activities:

(a) In the light of technological development, studies on technology and spectrum/orbit utilization for space communications will be pursued by ITU Radiocommunication Study Groups 1, 2, 3, 4, 7, 8, 10 and 11;

(b) In addition to Supplements No. 1 (Effect of World Administrative Radio Conference 1988 (WARC-88) Decisions), No. 2 (Computer Programs for Satellite Communications)(Fixed-Satellite Service) and No. 3 (Very Small Aperture Terminal (VSAT) Systems and Earth Stations) to the BR Handbook on Satellite Communications, which have already been published, Supplement No. 4 (Satellite Links in the Integrated Services Digital Network (ISDN)) is under preparation;

(c) The Telecommunication Standardization Bureau (TSB) is continuing its work on a study programme concerning the application of space technology in different services (e.g. aeronautical mobile services, maritime mobile services, land mobile services) and on the integration of satellite systems into the general telecommunication network. Numerous ITU-T and ITU-R Study Groups are developing recommendations, drawing up specifications and contributing to this work. The ITU Telecommunication Standardization Sector and the Radiocommunication Sector are also developing recommendations in order to ensure continuing and full integration of the satellite transmission medium in public digital networks, including ISDN, taking account of emerging technologies, applications and services;

(d) Following the decisions taken by the World Telecommunication Standardization Conference (Helsinki, 1993), an Intersector Coordination Group - Telecommunication Standardization Sector and Radiocommunication Sector - has been set up with a view to coordinating the direction of studies on Future Public Land Mobile Telecommunication Systems (FPLMTS) in particular relating to a satellite component of the systems;

(e) As part of its ongoing efforts in the evaluation of existing and new technologies, the BDT (ITU) is in the process of formulating an Interregional project on Space Communications Technology Applications for developing countries, particularly as a means of facilitating integrated rural development. The project seeks to promote the broad application of space communications technology in developing countries, whereby maximum benefits can be derived for the development of the countries concerned and for the satellite communications industry. The basic concept of the project is to forge a strong partnership between the space communications industry and the telecommunication operators/users community in developing countries;

(f) ITU publishes in its "Newsletter" at regular intervals (10 times a year) a list of satellites launched along with their technical characteristics and orbital parameters. Once a year, a complete "Table of satellites launched" is published;

(g) ITU also publishes a Report on Telecommunication and the Peaceful Uses of Outer Space;

(h) ITU also organizes world and regional telecommunication exhibitions and forums (TELECOMs). World TELECOM 95 will be held at Geneva, from 3 to 10 October 1995;

(i) BR (ITU) publishes quarterly an updated list of orbital positions and associated frequency bands for space stations on board geostationary satellites and non-geostationary space systems. In a more detailed form, BR publishes all the technical characteristics of satellite networks submitted to BR under the coordination or notification procedures, for recording in the Master International Frequency Register.

4. Regulation of the use of the geostationary satellite orbit and the radio-frequency spectrum allocated to space communication services

195. The 1993 World Radiocommunication Conference (WRC-93) has proposed draft agendas for the next two conferences. The purpose of WRC-95 and WRC-97 is to update the international radio regulatory processes and prepare for future requirements. WRC-95 is expected to initiate a new and simplified international radio regulatory regime, including new, less complex processes for coordination and registration of radio-frequency assignments. It is also expected to provide procedures to facilitate the use of frequency bands for satellite services for mobile communications, as a follow-up to allocation decisions taken by WARC-1992. A preliminary draft agenda has also been proposed for WRC-97. WRC-93 was therefore seen as a strategic planning exercise for future radio regulations and as a test to evaluate the efficacy of the new two-year cycle of WRCs and related preparatory work.

196. For the preparation of the technical, operational and regulatory procedural bases for these conferences, the ITU-R radiocommunication study groups are pursuing studies in the field of space radiocommunications concerning technical aspects of mobile satellite service, fixed-satellite, Earth-exploration satellite, space research and space operation services and low-orbit satellite systems.

5. Studies on and/or preparations for the establishment of new legal frameworks or the development of new systems to complement the existing legal frameworks

197. UNESCO by itself or in cooperation with the International Labour Organisation (ILO) and WIPO will undertake various actions to encourage further ratification and acceptance of the Convention Relating to the Distribution of Programme-carrying Signals Transmitted by Satellite (Brussels, 1974). The search for solutions of the copyright and neighbouring rights problems raised by the use of satellites for broadcasting purposes will remain one of the concerns of UNESCO. In particular, this relates to the copyright problems raised by the case of the direct broadcasting satellites. The legal aspects of the use of satellite remote sensing data may also be explored.

198. As follow-up action to the joint ITU/UNESCO study, "The rights to communicate at what price?", published in 1994, different projects and activities, such as a pilot project on access to telematics facilities in the Caribbean as well as a symposium on access to telematics in Africa, will be organized by ECA. The aim of these projects and activities is to strengthen the relationship between the services providers or telecommunications operators and the end users of public concerns sectors, in order to adopt improved tariffs structures to meet their needs.

199. WIPO will continue to study the changes brought about by new and emerging technologies, notably by digital technology, on copyright and neighbouring rights. Following a Worldwide Symposium on the Impact of Digital Technology on Copyright and Neighboring Rights (held at Harvard University, Cambridge, Massachusetts, from 31 April to 2 May 1993), WIPO organized a Worldwide Symposium on the Future of Copyright and Neighboring Rights at the Louvre in Paris from 1 to 3 June 1994. These activities should continue in 1995 and 1996.

200. WIPO is also proposing new international norms in the fields of industrial property, copyright and neighbouring rights. WIPO has recently set up an arbitration system for disputes between private parties and is finalizing work on a treaty on the settlement of intellectual property disputes between States, which could be ready in the period of 1995-1996. The question of the enforcement of intellectual property rights in outer space could perhaps be discussed in those contexts.

201. ICAO continues to make efforts to implement the communications, navigation and surveillance/air traffic management (CNS/ATM) systems, which are largely based on satellite technology. The Statement of

ICAO Policy on CNS/ATM Systems Implementation and Operation was approved in March 1994. A CNS/ATM High Level Task Force has been established by the ICAO Council to advise on the type and role of the ultimate ICAO mechanism to be established to support the implementation of the project including priorities, funding, cost-recovery aspects and ways of promoting the integrated systems among governments and financial institutions. The Task Force is expected to complete its work by December 1994 and already met twice in May and September 1994.

6. Land, maritime and aeronautical mobile satellite services

202. IMO has undertaken studies on a worldwide radio-navigation system and adopted a policy for recognition and acceptance of such systems (IMO resolution A.666(16)). GPS and GLONASS, which are candidate systems, are expected to be available for consideration and acceptance in 1994 and 1995, respectively. When either of these two or any other such system becomes operational, amendments to the 1974 SOLAS will be considered based on the above policy.

203. As the operational availability of the GPS has only been guaranteed by the United States of Amearica until 2005 and GLONASS by the Russian Federation until 2010, IMO is considering the need and seeking the means to develop plans for a post GPS/GLONASS, civil and internationally controlled Global Navigation Satellite System (GNSS) in cooperation with ICAO and other user organizations.

C. Meteorology and hydrology

1. Education and training programmes

204. UNEP will organize in 1995 a training course on assessment of water resources in the Western Asia region with the use of remote sensing technology for water resources managers from this region.

205. RCSSMRS (ECA), in cooperation with Earth Observation Sciences (EOS) of the United Kingdom of Great Britain and Northern Ireland and Aquater of Italy plan to hold a workshop to present the results of a remote sensing research project on "The monitoring of the fluctuation of water levels of the Central Rift Valley Lakes in Kenya". The workshop will take place from 27 February to 3 March 1995.

206. In the next few years, UNESCO will support the following postgraduate training courses:

(a) The Training and Education in Marine Science (TREDMAR) programme of UNESCO will release in 1994-1995 its fifth computer-based learning module on "Applications of marine and coastal image data - from satellite, airborne and in situ sensors". It contains applications by Latin American scientists and will be published first in Spanish. The first module with lessons in the windows version of the BILKO software is scheduled for 1995. Planned for 1996 is a CD-ROM containing all the existing lessons of the series with pertinent modifications, enhancements and local variations suggested by the users. The overall objective, to help strengthen marine and coastal training and education, is gradually being realized through the growing network of users and producers of the lessons. At present, this virtual "global faculty" consists of people from about 70 countries who are using the modules for teaching, for continuing education and as a research tool. Their feedback, especially on new lessons, continues to provide the project with a strong basis for future developments;

(b) UNESCO, within the framework of the International Hydrological Programme (IHP) and in cooperation with ITC, will organize in 1995-1996 training courses on the use of remote sensing images and GIS in water research studies;

(c) At UNESCO, the Intergovernmental Oceanographic Commission (IOC) organizes regional training courses on the applications of satellite remote sensing to marine studies, making use of the afore-mentioned computer-based learning modules; these training courses should continue in 1995 and beyond.

207. At UNESCO, IOC organizes regional training courses on the applications of satellite remote sensing to marine studies, making use of the computer-based learning modules; these training courses will continue in 1995 and beyond.

208. WMO plans to continue to collaborate with the United Nations, other organizations and member countries in the co-sponsorship of training events during 1995-1996. The WMO proposals for satellite-related events for the biennium 1995-1996 include the seventh training course on tropical meteorology and tropical cyclone forecasting; the second southern hemisphere training course on tropical cyclones; the Regional Association (RA)-IV Workshop on hurricane forecasting and warning; and a training course on wave analysis and forecasting (including satellite data application).

Fellowships

209. Through the United Nations Programme on Space Applications, ESA is providing fellowship support for the in-depth training of participants from developing countries in the area of satellite meteorology.

210. IOC (UNESCO) provides grants annually, through the Training, Education and Mutual Assistance Programme, for short-term training which enables scientists from developing countries to participate in marine-related remote sensing training.

211. WMO grants fellowships under its Voluntary Co-operation Programme (VCP) and its regular budget, as well as under UNDP and trust funds for studies or training in meteorology and operational hydrology, including studies and training in satellite meteorology, interpretation of meteorological satellite photographs, satellite transmission systems and nephanalysis. In addition to fellows being trained at some of the WMO Regional Meteorological Training Centres, some countries also provide training in numerical weather prediction products and interpretation of meteorological satellite data through fellowships offered by them under VCP.

2. Expert services and survey missions to identify specific areas of applications relevant to a given country or group of countries and to carry out specific studies on pilot projects or to implement the projects with operational applications of technology

Provision of expert services

212. UNEP will continue its work with the African Centre for Meteorological Applications for Development.

213. ESCWA, recognizing a strong need to study and assess surface and groundwater resources, is promoting a comprehensive hydrological and hydrogeological survey of these resources with emphasis on shared water systems. The project, which is to be finalized within the present biennium, 1994-1995, is being implemented in cooperation with UNEP and the Islamic Development Bank. Remote sensing techniques, GIS and "conventional" hydrological/hydrogeological methods will be used in order to make accurate assessment, to formulate action plans and to draw up a framework for cooperation among countries of the ESCWA region. The Royal Jordanian Geographic Centre has been identified as the main contractor for the execution of the project. Maps to the scale of 1:250,000 will be produced as a result of this project. Furthermore, through provision of training on Remote Sensing Techniques and the application of GIS, the project will strengthen endogenous capabilities in ESCWA member States.

214. FAO is assisting in developing a Nile forecasting centre within the Ministry of Public Works and Water Resources at Cairo to monitor and forecast the flows of the Nile River and its tributaries. The project, which is funded by USAID, is designed to assist Egyptian planners in the more effective regulation of the Nile waters stored in Lake Nasser, with an integral part involving the real-time receipt and processing of environmental satellite data for precipitation estimation. The project is being carried out with the National Weather Service of the United States (NOAA) as a subcontractor for the development of hydrological models.

215. The FAO Fisheries Department plans to install a satellite ground receiving station for NOAA/AVHRR-LAC image data. The station will be used for satellite limnology, in support of the FAO/FINNIDA project entitled "Research for the management of fisheries on Lake Tanganyika".

216. The application of satellite technology in meteorology and operational hydrology forms an important element of the technical cooperation activities of WMO. These activities are generally undertaken with assistance from the voluntary cooperation programmes of either WMO or UNDP. The following activities are planned for 1994 and future years:

(a) Africa: A number of countries, including France, Germany, Italy, United Kingdom and United States, are donating DCPs for the collection of meteorological data via the geostationary meteorological satellite Meteosat to 50 countries in Africa in order to upgrade meteorological observations. Furthermore, a network of eight satellite stations of the International Maritime Satellite Organization are foreseen to be installed in the countries of the Permanent Inter-State Committee on Drought Control in the Sahel with funding from USAID, to enhance data and products flow between the AGRHYMET Regional Centre in Niamey and the national AGRHYMET centres. A high-resolution picture transmission satellite receiving system has been installed in Egypt using national funds. Some key stations in the Zambezi river basin will be equipped with DCPs using the Meteosat system for collecting data. A multidonor project is now under preparation to monitor desert locusts in Africa. Under the project, 50 automatic stations will be installed. In the Niger river basin, 64 DCPs using the Argos system have been operational for a number of years, and plans are being made to install more recent equipment. In collaboration with the World Bank, WMO has drawn up plans to set up in Africa an advanced hydrological and environmental monitoring system using Meteosat. About 100 stations will be installed on major rivers, costing between $10 million and $20 million over a period of five years;

(b) Americas: A plan for the new Regional Meteorological Telecommunication Network (RMTN) based on two-way multipoint telecommunication services via satellites has been agreed upon, and is scheduled for implementation in the second half of 1994 and the first part of 1995, involving more than 20 countries. The plan will be implemented as part of a project of FINNIDA for the Central American countries and through other international cooperation funding, mainly from the United States, for the remaining countries in the southern part of the North and Central American region. The implementation of this plan will dramatically improve the meteorological telecommunication system in the region, including support for the Tropical Cyclone Programme. In Colombia, 25 DCPs have been installed in the Magdalena-Cauca basin for hydrological forecasting purposes using NOAA Geostationary Operational Environmental Satellites (GOES);

(c) Europe and newly independent States: Some European countries such as Albania, Romania and Turkey have expressed their need to establish and/or upgrade their meteorological satellite receiving systems. The newly independent States of the former Soviet Union and former Republics of Yugoslavia are planning to acquire satellite receiving stations to actively monitor the meteorological conditions. A plan for the new RMTN in Europe based on telecommunication services via satellite has been agreed upon and is being developed with a view to its implementation in 1995-1996.

Study, pilot projects and operational applications

217. UNEP will continue to participate in developing and supporting the programmes of the GCOS secretariat in 1994-1995 and beyond.

218. UNEP is cooperating with FAO, UNESCO, WMO and ICSU in supporting the planning process for GTOS. GTOS is envisaged as one of a number of global observing systems which will be complementary to each other and mutually supportive. It will provide the observational framework and data basis for (a) detection and understanding of the impact of regional and global changes on terrestrial and freshwater ecosystems; (b) evaluation of the impact and consequences of global changes on terrestrial ecosystems components and the environment; (c) forecasting, prediction and early warning of future terrestrial changes and their impact; and (d) validation of global models of ecosystem processes and changes.

219. UNEP is continuing its close cooperation with GOOS.

220. UNEP is also continuing its support for the WMO Global Atmosphere Watch (GAW) as an early warning system.

221. UNEP, through its Ocean and Coastal Areas Programme Activity Centre and the GRID-Nairobi facility, with funding from the Government of Belgium, will continue to implement a programme to develop a marine and coastal zone database and atlas for Eastern African countries. This will serve information for coastal zone management purposes. The work is largely based on classifications derived from LANDSAT-TM images and will continue through 1995.

222. RCSSMRS (ECA), in cooperation with EOS of the United Kingdom and Aquater of Italy, will develop and create various databases and methodology for monitoring fluctuation of water levels for inland lakes in developing countries.

223. FAO, within the framework of the ARTEMIS phase III project, will continue a major satellite rainfall estimation calibration programme in cooperation with the University of Reading, United Kingdom, and regional FAO projects in the IGADD and SADC regions. Under this programme, the ground-measured rainfall data from approximately 1,000 meteorological stations in Africa are systematically correlated with cold cloud duration data derived from the ARTEMIS hourly Meteosat observations. Meteosat-based quantitative rainfall estimates are obtained by linear regression. Their accuracy is expected to increase with extended duration of the calibration programme.

224. The Fishery Department of FAO conducts remote sensing activities for fisheries. Satellite remote sensing, in particular when combined with GIS, is increasingly used in marine and inland fisheries projects. FAO is developing a GIS for the world ocean fisheries, resources and environment in 1995 and 1996.

225. UNESCO will continue its cooperation with FAO, IGBP, UNEP and WMO in the development of GTOS, which will cover the broad question of monitoring biodiversity. Two UNESCO activities within the MAB (UNESCO) programme are of special relevance: the International Network of Biosphere Reserves and the Diversitas Programme.

226. IOC (UNESCO), in cooperation with the Norwegian Global Resource Information Database (GRID)-Arendal facility, will continue to develop marine data information systems.

227. Within the framework of the WMO plan of action for the International Decade for Natural Disaster Reduction, a special project on a tropical cyclone warning system for the South-West Indian Ocean region has been established with financial assistance from the European Development Fund. This project to upgrade

the tropical cyclone warning system for the South-West Indian Ocean is based on the application of meteorological satellite and microcomputer technology and on the transfer of scientific knowledge.

228. The overall long-term goals of the WMO/ICSU/IOC/WCRP are to determine to what extent climate can be predicted and the extent of human influence on climate. Progress in this scientific programme on the successful continuation or new development of main space observing systems is described below:

(a) The scientific plan for WCRP gives high priority to understanding the effects of cloudiness on the radiation energy budget. The International Satellite Cloud Climatology Project (ISCCP) is producing long-term climatological records of global cloud amount and properties, as well as radiation flux data from the international array of geostationary meteorological satellites and operational polar-orbiting satellites. The project has been extended through 1995;

(b) Two major observational programmes are involved within WCRP: the study of the inter-annual variability of the Tropical Ocean and the Global Atmosphere, 1985-1995, and the World Ocean Circulation Experiment (WOCE). The successful launching of the joint Ocean-surface Topography Experiment/Poseidon satellite mission by France and the United States of America in 1992, and that of the European oceanographic satellite mission, ERS-1 in 1991, have been of particular importance for the success of WOCE, which will continue until 1997 with global oceanographic observations;

(c) WCRP has initiated projects to produce monthly fields of sea-surface temperature and precipitation based on a combination of remote sensing data from multiple satellite sources and ground-based measurements;

(d) WCRP is preparing a Global Energy and Water Cycle Experiment (GEWEX), planned for 1995-2000, based on the multinational Earth Observing System. In addition, a major component of the experiment will be the GEWEX Continental-scale International Project (GCIP) on the Mississippi river basin, and several similar regional studies in other parts of the world.

229. WMO has become a full co-sponsor of GOOS by IOC (UNESCO), including in particular the scientific and technical planning and intergovernmental aspects. An IOC/WMO/ICSU Memorandum of Understanding of the Joint Scientific and Technical Committee for GOOS (J-GOOS) was also signed in September 1993. The first session of the J-GOOS was held in May 1994. WMO provides staff and other support to the GOOS secretariat, and will actively participate in all aspects of GOOS development and implementation in 1995 and beyond.

230. Climate monitoring activities within WCDMP involve satellite data including sea-ice, snow cover, solar radiation, aerosol optical depth, albedo and clouds. WMO climate data information referral system (INFOCLIMA) includes information on some available satellite data sets needed for climate monitoring and research. A Climate Change Detection Project has been established under the WCDMP to advise on the suitability of data, including satellite data, for detecting climate change. The World Climate Applications and Services Programme (WCASP) continues to investigate and promote development of potential uses of satellite data in climate applications.

231. WMO continues to provide valuable data on atmospheric status through its GAW, which was established in 1989 as an early warning system to detect changes in the greenhouse gases, including ozone, aerosols and other trace substances in the atmosphere that may lead to global climate change. GAW consists of surface and vertical observations to provide the information required to verify future satellite-based measurements of selected atmospheric constituents. In particular, GAW, through its more than 150 total ozone stations, has furnished critical ground truth data to calibrate ozone observations from space.

232. The WMO Commission for Atmospheric Sciences continues to rely on the use of satellite data for research, for both climate studies and weather analysis and prediction of all time scales. The WMO Programme on Short- and Medium-range Weather Prediction Research (PSMP) and Tropical Meteorological Research (TMRP) will study the application of high-resolution quantitative satellite data.

233. Based on the structure of the WMO hydrology and water resources programme, a number of projects relating to hydrological networks and instrumentation, hydrological forecasting methods and systems, and the application of remote sensing techniques to operational hydrology are undertaken on a continuing basis. The programme is revised by the WMO Commission for Hydrology every four years. The results of the projects formulated by the Commission at its tenth session in 1993 will be available in 1996. WMO has recently published two reports: Remote Sensing for Hydrology - Progress and Prospects and Applications of Remote Sensing by Satellite, Radar and other Methods for Hydrology. These were issued in 1992 and 1994, respectively. A project on the intercomparison of data telemetry and transmission systems is currently being planned for implementation during 1995-1996.

234. WMO and the World Bank are promoting a major long-term initiative to improve knowledge of the hydrological cycle through a World Hydrological Cycle Observing System (WHYCOS). WHYCOS would consist initially of about 1,000 stations worldwide sited on major rivers. Each station would monitor about 15 variables such as flow, load, water chemistry and on-bank meteorological variables. Many of these stations already exist, mostly in the developed world. The data collected would be transmitted via geostationary satellites to national, regional and global centres, employing the WMO World Weather Watch (WWW) system where applicable. In turn, WHYCOS would contribute data to WWW and to GCOS, as well as to GTOS. The concept is currently being developed for Africa, Latin America and the Caribbean, for countries bordering the Mediterranean Sea and for the Aral Sea basin.

235. WMO, IOC (UNESCO), UNEP and ICSU have established a Joint Scientific and Technical Committee (JSTC) for GCOS and a Joint Planning Office. Subsequently, JSTC established a Space-based Observation Task Group, which is developing a GCOS Space Plan. The Plan includes: (a) scientific and technical requirements to meet the various GCOS objectives; (b) the GCOS IOS for space; and (c) specific recommendations for action by the agencies providing space-based data. It is expected that the Initial GCOS Space Plan will be prepared and published during the 1994-1995 period.

3. Dissemination or exchange of information on the status of technology or operational systems through meetings or publications

236. UNESCO, within the framework of IHP and in collaboration with ITC, will publish a sourcebook on GIS applications to water resources management.

237. UNESCO, within the framework of IHP and in collaboration with the International Association of Hydrological Sciences (IAHS), will organize the Second Conference on "GIS Applications in Hydrology and Water Resources Management" in 1996 in Vienna, Austria.

238. ITU Radiocommunication Study Group 7 will continue to study questions relating to the meteorological-satellite service and associated technologies throughout the next study period.

239. Considerable efforts continue to be undertaken within WMO, in cooperation with IOC (UNESCO), to provide information on developments in INMARSAT to collect SHIP reports and disseminate warnings and forecasts.

240. Within its training publications programme, WMO updated publication No. 240, Compendium of Training Facilities for Meteorological and Operational Hydrology.

241. The WMO Commission for Marine Meteorology (CMM), the joint IOC/WMO Committee for Integrated Global Ocean Service System (IGOSS) and the IOC Committee for the International Oceanographic Data and Information Exchange (IODE) maintain a close interest in the use of satellites for both ocean observation and marine communications. A CMM/IGOSS/IODE group of experts has prepared a consolidated report on polar-orbiting oceanographic satellites, and will extend this report in 1995 and beyond to cover also geostationary satellites, other ocean remote sensing and the management of ocean satellite data.

242. A study by the rapporteur of the WMO working group on agrometeorological data management on the processing, analysis and application of remote sensing data to agriculture of the Commission for Agricultural Meteorology (CAgM) is in progress, and the report will be submitted to the CAgM eleventh session for consideration for publication. This report will contain a section on Climate Applications Referral System (CARS)-Remote-Sensing.

D. Basic space science

243. The Fifth United Nations/ESA Workshop on Basic Space Science will be organized for Member States in the ESCAP region in November 1995 at Karachi, Pakistan.

244. The United Nations Programme on Space Applications will publish selected manuscripts from the activity of the Programme conducted in 1994 at Cairo, Egypt (see para. 139 above).

245. The Office for Outer Space Affairs will prepare a study on "Basic space science in developing countries".

246. RCSSMRS (ECA), in cooperation with MEDIAS (France) and the Kenya Meteorology Department, plans to hold a regional summer school for space physics with special emphasis on "Africa and global change" from 13 to 25 February 1995.

E. Safety aspects

247. BDT (ITU) has a programme from 1994 to 1999 to elaborate master plans for the implementation of the GMDSS and the development of maritime radiocommunication services.

248. ITU Radiocommunication Study Group 8 (Mobile services), and particularly its Working Party 8D, continues to deal with technical and operating characteristics necessary for compatibility, inter-operability and the required performance levels for systems in the mobile satellite services. Task Group 8/1 of the Study Group deals with Future Public Land Mobile Telecommunication Systems, including their satellite components.

249. IMO, in close cooperation with BR (ITU) and the IHO International Hydrographic Bureau, has undertaken a study of a worldwide system for electronic display and information systems on board ships, including means of updating electronic navigational charts, which will be broadcast through the INMARSAT enhanced group call and SafetyNET systems. An operational performance standard for Electronic Chart Display and Information Systems (ECDIS) has been approved and is being implemented.

250. The amendments to the International Convention for the Safety of Life at Sea (SOLAS) adopted by the 1988 Conference of Contracting Governments entered into force on 1 February 1992 introducing GMDSS. The system is being introduced in stages and will be fully implemented on 1 February 1999. Satellite communications form a major part of GMDSS, and all SOLAS Convention ships are requested to carry satellite EPIRBs and are being encouraged to fit other satellite equipment. IMO also continues to prepare the Master Plan of shore-based facilities for GMDSS.

251. The further development of GMDSS to provide for its orderly introduction will be continued by IMO in close cooperation with ITU, WMO, the International Hydrographic Organization (IHO), INMARSAT and the International Satellite System for Search and Rescue (COSPAS-SARSAT).

252. The Principles of Safety, approved by the General Assembly of the United Nations, are based on the recommendation of the International Commission on Radiological Protection (ICRP) and have established a process of review and revision for up-date. The ICRP recommendation has been recently revised. In this connection, a Joint Secretariat of the FAO/IAEA/ILO/NEA (OECD)/Pan American Health Organization (PAHO) and WHO has translated the most recent recommendations from ICRP into the new International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (BSS), which would be useful for sources in outer space as well. BSS have been approved by the IAEA Board of Governors, to be immediately followed by the issue of an interim publication of BSS in English. The final multilingual publication is expected to be issued in 1995, after the adoption of BSS by the other organizations.

253. IAEA has prepared a Safety Series Document on Emergency Planning and Preparedness for Nuclear Powered Satellite Re-Entry, the purpose of which is to provide a general and comprehensive overview of the management of incidents or emergencies that may be created when nuclear power sources employed in space systems accidentally re-enter the earth's atmosphere and impact on its surface. This document is expected to be published in 1995.

254. IAEA continuously reviews more than 100 documents (standards and guidance) on the safety of reactors in land-based nuclear power plants and also for research reactors, which have been issued in its Safety Series. Many requirements and recommendations in these documents may be applicable to the safety of nuclear power sources in outer space.

F. Other activities in the field of space science and technology and its applications

255. The following international workshops are being planned by the United Nations Programme on Space Applications in 1995:

(a) United Nations/United States International Workshop on Spin-off Benefits of Space Technology: Challenges and Opportunities, 1995;

(b) United Nations Regional Conference on Space Technology for Sustainable Development in Latin America and the Caribbean, 1995;

(c) United Nations International Workshop on the Development and Design of Small Experimental Payloads, 1995, in Spain;

(d) Second United Nations Regional Conference on Space Technology for Sustainable Development in the region of ECA, 1996.

256. The United Nations Programme on Space Applications will publish selected manuscripts from the activity of the Programme conducted in 1994 at Graz, Austria, and Jerusalem (see para. 139 above).

257. The Office for Outer Space Affairs continues to issue the Monthly Survey of Selected Events in the Peaceful Uses of Outer Space to provide information on worldwide space activities in various fields. This publication compiles articles selected from a number of periodicals related to space activities.

258. In response to the Working Group of the Whole of the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space, the Office for Outer Space Affairs will prepare the studies on "Space applications for sustainable development", "Developing tele-education programmes through international cooperation", "Global change: actual participation of the developing countries and possibilities of enhancing it", "Small microsatellites: current projects and future perspectives for international cooperation", and "Global exchange of scientific and technical information: networking possibilities for developing countries".

259. UNIDO continues to make efforts to promote cooperation between developed and developing countries for maximizing the benefits of space technology spin-offs for developing countries. The promotion and the organization of its Programme for Realizing the Benefits of New Technology Spin-Offs in Developing Countries (A/AC.105/551, para. 222) are explained in issue No. 30 of the UNIDO quarterly publication "Advances in materials technology monitor", which focuses on the application of new materials developed within the framework of the former Union of Soviet Socialist Republics space programme. In response to the positive feedbacks from both developing and developed countries to the above publication, UNIDO organized an expert group meeting on the Benefits of High Technology Spin-Offs for Developing Countries, which was held from 20 to 22 December 1993.

260. As a result of the above-mentioned expert group meeting, UNIDO outlined an international work programme for a period of three years and will finalize it by early September 1994. Subsequently, UNIDO will present this programme to the relevant governmental organizations and companies involved with space programmes and technologies for their consideration towards eventual participation. The key features of this programme are technology spin-off monitoring, assessment and forecasting, establishment of relevant databases, development of solutions to specific problems related to the technology transfer process and the funding mechanisms for its elements. The programme also includes assistance to countries in formulating and implementing a national policy and strategy in this area, as well as providing an international framework for the transfer and application of high technology spin-offs. A TECHMART, the business forum for technology transfer and joint-venture opportunities focusing on high technology spin-offs and their application in industry, will be organized for this purpose. As a part of the programme and the Industrial Technology Monitor Series, UNIDO will publish a quarterly Monitor that will be fully devoted to this particular subject of benefits of high technology spin-offs and technology transfer. It is anticipated that the first two issues will be published in 1994.

261. In accordance with General Assembly resolution 48/39, the Legal Subcommittee, at its thirty-third session, which was held in Vienna from 21 March to 5 April 1994, considered the question of early review and possible revision of the principles relevant to the use of nuclear power sources in outer space (A/AC.105/573, paras. 23-30 and annex I), matters relating to the definition and delimitation of outer space and to the character and utilization of the geostationary orbit, including consideration of ways and means to ensure the rational and equitable use of the geostationary orbit without prejudice to the role of the international telecommunication union (A/A*C.105/573, paras. 31-37 and annex II) and the legal aspects related to the application of the principle that the exploration and utilization of outer space should be carried out for the benefit and in the interests of all States, taking into particular account the needs of developing countries (A/AC.105/573, paras. 38-45 and annex III). Subject to the decision of the General Assembly, the Legal Subcommittee will continue to consider these questions in 1995.

Notes

[1]Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992 (United Nations publication, Sales No. E.93.I.8 and corrigenda), vol. I: Resolutions Adopted by the Conference, resolution 1, annex II.